

MONTHLY WEATHER REVIEW,

NOVEMBER, 1881.

(General Weather Service of the United States.)

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

In preparing this REVIEW the following data, received up to November 20th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 133 Signal Service stations and 14 Canadian stations, as telegraphed to this office; 179 monthly journals and 166 monthly means from the former, and 14 monthly means from the latter; 219 monthly registers from Voluntary Observers; 57 monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; Marine reports through the co-operation of the New York Herald Weather Service; monthly reports from the local Weather Services of Iowa, Nebraska and Missouri, and of the Central Pacific Railway Co.; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure over the United States and Canada for the month of November, 1881, is shown by isobaric lines (in black) upon chart No. II. The areas of lowest mean pressure cover the Lake Superior region and the eastern portion of the Canadian Maritime Provinces, while their counterpart, the areas of highest mean pressure, occupy the eastern portion of Tennessee, the northwestern portion of the South Atlantic states, and the central portions of the Middle and Northern Plateau regions. Compared with the preceding month there has been a very decided fall in pressure at most stations north of the 42d parallel and east of the 100th meridian. This region, for the most part, had but just recovered during the month of October from a long period of deficiency, when the month of November introduced a remarkable series of areas of barometric minima in the vicinity of parallel 50° N., a study of which can be made from chart No. I. With hardly an exception, the pressure throughout the remaining portions of the country has risen, the most decided changes coinciding with the regions of highest mean pressure for the month.

Departures from the Normal Values for the Month.—Compared with the means of previous years, the mean pressure for the present month is everywhere above the normal except in the Upper Lake region, Florida Peninsula, South Pacific coast and the Upper Mississippi and Missouri valleys. The regions of greatest deficiency are the Lake Superior and extreme Northwest; departures ranging from 0.05 to 0.09 inch. The regions of greatest excess are found in New England and along the North Carolina coast; departures ranging from 0.07 to 0.14 inch. On the Pacific coast the departures range from -0.06 inch at San Diego to +0.06 inch at Red Bluff. Stations reporting a normal condition are as follows: Cheyenne, North Platte, Leavenworth, Brownsville and Winnemucca.

Barometric Ranges.—The range of pressure for the month has generally varied from 0.8 to 1.3 inches, and in the extremes from 0.3 inch at San Diego and 0.43 inch at Key West to 1.66 inches at Eastport and 1.87 inches at Deadwood. Throughout the several districts the monthly barometric ranges varied as follows: New England, from 1.17 inches at New Haven to 1.33 inches at Thatcher's Island and 1.66 inches at Eastport; Middle Atlantic states, 0.99 at Lynchburg and 1.00 at Washington to 1.11 at New York and 1.12 at Albany; South Atlantic states, 0.72 at Atlanta to 1.05 at Kittyhawk and 1.08 at Hatteras; Florida Peninsula, 0.43 at Key West to

0.70 at Cedar Keys; East Gulf states, 0.59 at Vicksburg to 0.75 at New Orleans; West Gulf states, 0.70 at Port Eads to 1.04 at Fredericksburg and Ft. Gibson and 1.09 at Mason; Rio Grande valley, 0.93 at Castroville to 1.02 at Brackettville; Ohio valley and Tennessee, 0.71 at Chattanooga to 1.13 at Champaign and 1.15 at Morgantown; Lower Lake region, 1.04 at Cleveland to 1.09 at Detroit and 1.10 at Buffalo and Rochester; Upper Lake region, 1.06 at Port Huron to 1.32 at Duluth and 1.42 at Marquette; extreme Northwest, 1.21 at Bismarck to 1.25 at Moorehead and 1.30 at Ft. Stevenson; Upper Mississippi valley, 0.85 at Cairo to 1.17 at Des Moines and 1.32 at La Crosse; Missouri valley, 1.06 at Leavenworth to 1.19 at Tunkton, and 1.25 at Ft. Bennett and Huron; Southern slope, 0.47 at Coleman to 1.15 at Jacksboro and 1.20 at Henrietta; Middle slope, 0.83 at Denver to 0.99 at Dodge City; Northern slope, 0.77 at Cheyenne to 1.22 at Ft. Benton and Ft. Assinnaboine, 1.87 at Deadwood; Northern plateau, 0.58 at Lewiston to 0.95 at Boise City and 1.05 at Dayton; Middle plateau, 0.65 at Winnemucca to 0.78 at Salt Lake City; Southern plateau, 0.43 at Tucson to 0.54 at Silver City and 0.83 at Phoenix; South Pacific region, 0.30 at San Diego to 0.50 at Visalia and 0.52 at Yuma; Middle Pacific region, 0.52 at Sacramento, and 0.53 at San Francisco to 0.69 at Red Bluff; North Pacific region, 1.00 at Roseburg to 1.14 at Portland and 1.32 at Olympia.

Areas of High Barometer.—Seven distinct areas of high barometer passed over the regions covered by the Signal Service stations, all except one, (No. VII) appeared first in the extreme northern portion of the Rocky Mountain region or on the North Pacific coast, and had apparently approached this region from the North Pacific. The average course of movement was to the east after passing the eastern slope of the Rocky Mountains and to the southeast while central in the mountain districts.

No. I.—On the 1st of the month an extended area of cold and dry air appeared on the Pacific coast, moving to the southeast. The pressure rose 0.2 inch above the normal of the month in the Rocky Mountain regions on the 2d, attended by light snow and freezing weather as far south as Santa Fe. The winds shifted to northerly in the Southwest during the afternoon of the 2d, and the p. m. report of that date shows a maximum velocity of 55 miles per hour at Indianola and 48 miles at Galveston. Dangerous northerly winds continued in the Gulf of Mexico during the 3d as the pressure increased to the eastward in the Southern states. This area apparently divided on the 4th, the greater portion remaining in the Rocky Mountain regions, while a detached area moved to the northeast, following the general direction of the coast line to New England, during the 4th, 5th, 6th and 7th, and then passing over the North Atlantic. Killing frosts occurred at Vicksburg, Atlanta, Chattanooga and Charlotte and light frosts at Pensacola, Augusta and Jacksonville on the 4th, when the pressure was high in Louisiana.

No. II.—This area was central in the Northern Rocky Mountain region on the 9th, when the pressure ranged from 0.2 to 0.5 inch above the normal for the month from the Lake region westward to the Pacific coast. On the 16th, the centre was clearly located near St. Paul, and on the 11th and 12th the movement was directly eastward over the Lake region and New England, attended by light snow and killing frosts along the line of greatest pressure. After reaching the Atlantic coast the course apparently changed to the southeast and the area passed on this line beyond the limits of observation.

No. III.—The midnight report of the 13th showed a rapid increase of barometric pressure in British America and north of the Upper Missouri valley, with a rapid decrease in pressure on the Pacific coast, on the afternoon of the 14th. The barometer was 0.4 inch above the normal in the Northwest, and 0.8 inch below the normal in Washington territory; this distribution of pressure indicates that this area either originated east of the mountains in British America or passed to that position from Alaska. This area followed the general course of the Missouri valley until the 15th, and then moved eastward over the Ohio valley, the centre being near Pittsburg at 11 p. m. on that day. Severe frosts occurred on the morning of the 16th in the Middle states. The barometer continued high on the Atlantic coast during the 17th, but the pressure declined slowly as this area moved northeastward from the Middle Atlantic coast to Nova Scotia, where it was last observed.

No. IV.—During the 18th the pressure was above the normal and increasing in all the districts west of the Mississippi river, the greatest departure being reported on the North Pacific coast, when the centre of this area was located near Salt Lake. After passing the Rocky Mountains this area moved slightly north of east over the central portion of the United States, attended by very rapid changes in temperature in the central valleys, a severe norther in Texas and freezing weather as far south as Shreveport, Vicksburg and Augusta on the morning of the 20th. Dangerous northwest winds occurred on the Middle Atlantic and New England coasts on the 20th, the highest velocities being 52 miles per hour at Delaware Breakwater, 44 miles at Cape Henry, 40 miles at Block Island and 43 miles at Yarmouth—all from the northwest. This area apparently moved eastward from the Middle Atlantic coast after the 20th.

No. V.—The a. m. maps of the 21st clearly defined this area as central in the extreme Northwest and extending over the mountain regions from Mexico to British America. On the morning

of the 22d a portion of this large area became detached and moved eastward to the Lake region, leaving the barometer from 0.1 to 0.3 inch above the normal for the month in the mountain districts. On the 22d this area was central over New England and the temperature was below freezing as far south as Washington. On the 23d the pressure declined on the Atlantic coast as this area moved to the east of Halifax.

No. VI.—Appeared in the Upper Missouri valley on the afternoon of the 23d, and moved to northern Texas, where it was central at the a. m. report of the 24th. Freezing weather was reported from stations west of the Mississippi, and the winds shifted to northerly in Texas as low area No. XIII moved to the east in the Gulf. On the 24th the storm became severe in the western Gulf, when the region of greatest pressure extended over Indian territory and Kansas. The lowest temperatures of the month were reported from the Gulf and South Atlantic states, as this area passed over the Southern states. Killing frosts occurred at Indianola, New Orleans, Mobile, Pensacola and Jacksonville on the 25th. Special warnings were telegraphed by the Chief Signal Officer to New Orleans and Jacksonville, informing those interested in sugar and fruit crops of the approach of this cold wave. This area advanced to the South Atlantic coast on the 25th, but the barometer continued high in the Southern states until the 28th, when the distribution of pressure was changed by the approach of high area No. VII.

No. VII.—Appeared suddenly at midnight of the 27th north of the Lake region and advanced from Hudson's Bay over the St. Lawrence valley and New England, attended by the lowest temperatures of the month in the northeastern portion of the United States. After reaching the coast the pressure increased to the southward on the 29th, after which the pressure declined, with rising temperature and northeast to southeast winds at stations along the Atlantic coast.

No. VIII.—The history of this area, as it affects the stations east of the Rocky Mountains, will be given in the December REVIEW. On the 30th the pressure was high in the Plateau regions and the indications were that a cold wave was approaching the Mississippi valley.

Areas of Low Barometer.—Sixteen barometric depressions appeared within the limits of the stations of observation during the month of November. Three of these passed from the tropics to the Gulf states, three apparently originated in the Southwest, and three probably passed from the Pacific across the Rocky Mountains to the Lake region. Chart No. I shows that these disturbances occurred in latitudes north of the mean track of November storms.

No. I.—This slight depression passed north of the Lake region, on the 1st, unattended by marked atmospheric changes within the United States. At midnight of the first the pressure was high in the western districts, and on the Atlantic coast these areas of high barometer were separated by a trough of low pressure in the Mississippi valley. With the advance of high area No. I, this trough of low pressure was divided and formed low areas Nos. II and III, the former central in Texas on the morning of the 2d, and the latter central in the Upper Lake region.

No. II.—Developed in the Southwest on the 1st, attended by rain and warm southerly winds and disappeared on the 2d in advance of high area No. I, which caused very rapid changes in temperature and high northerly winds over the region covered by this depression on the 2d.

No. III.—This storm appeared in the Upper Lake region on the morning of the 2d, and increased in severity as the centre passed northeast to the St. Lawrence valley. The pressure at the centre of this storm declined as the disturbance moved eastward and the winds became dangerous on the lakes after shifting to westerly. The sudden fall of temperature and the area of precipitation attending this storm extended over all districts east of the Mississippi. Heavy snows fell in the Lake region, where brisk and high westerly winds continued until the 4th, when the centre of disturbance was near Eastport. Northwesterly gales occurred on the North Atlantic coast north of Cape Hatteras on the night of the 3d. Cautionary signals were ordered from eight to twenty-four hours in advance of this storm at stations on the Atlantic coast, but the cautionary signals ordered for the lake ports were in some cases late. This storm crossed the St. Lawrence valley on the night of the 3d, and increased in energy until the night of the 4th, when the pressure at the centre had fallen to 29.04 inches, at Anacosti Island, with the wind reported as a gale from the south at 11 p. m. The gale continued at this station on the 5th, the wind shifting to westerly, and at Farther Point the wind increased to 45 miles per hour. This storm apparently moved to the southeast after leaving the Gulf of St. Lawrence and probably moved to the north of the track of vessels passing from Europe to America.

No. IV.—Was central in the Lower Missouri valley on the afternoon of the 4th, while low area No. III was passing to the northeast of New England. This disturbance was first observed in the Northern Rocky Mountain region on the night of the 3d; the track of the centre being southeast until it reached the Mississippi valley, after which the course was northeast over the Lake region and St. Lawrence valley. Light snow and rain fell at stations north of parallel 40° as this depression passed to the east during the 4th and 5th. The highest winds occurred on the Lower Lakes, the track of disturbance being confined to narrow limits. The highest velocity reported was 36 miles per hour from the southwest at Sandusky.

No. V.—The p. m. report of the 5th indicated the presence of a disturbance in the West Gulf, and the midnight report of the same date shows that during the preceding eight hours the wind reached a velocity of 32 miles per hour at Galveston and 36 miles at Indianola. This storm moved to the northeast, the centre passing near Port Eads, at the mouth of the Mississippi, during the 6th. Very heavy rains occurred in the Gulf states, and dangerous winds were reported in the East Gulf. Pensacola reported a velocity of 40 miles per hour from the southeast on the night of the 6th. This storm disappeared as a cyclonic disturbance after reaching the East Gulf states.

No. VI.—This storm passed from the Pacific east of Portland on the 5th causing heavy rains in Oregon and Washington territory. The barometer fell to 29.47 inches at Olympia on the afternoon of the 5th, when the centre was near that station. Heavy snows occurred in Montana and Idaho on the 6th, as this depression passed over the mountains. On the morning of the 7th the centre of greatest depression was located near Pembina, where the barometer indicated a pressure of 29.34 inches. The p. m. chart of this date exhibits a trough of low pressure extending from Texas to British America; the barometer being high in New England and the winds in all districts east of the Mississippi from south to east, apparently under the influence of this depression. The storm continued to move eastward and passed over the Lake region on the 8th, causing high winds at all stations on the Upper Lakes and Lake Erie. The maximum velocities occurred after the winds had veered to the west. This storm crossed from the Pacific to the Atlantic in five days and eight hours, approximately on the parallel of the northern boundary of the United States, and it left the Atlantic coast attended by severe gales in the Northeastern Provinces. These gales continued during the 16th and 11th after the centre of disturbance had passed east of the coast line. Cautionary signals were displayed at the Lake ports and on the Atlantic coast north of Cape Henry, giving warning of the approach of this storm.

No. VII.—The distribution of barometric pressure over the United States on the 10th indicated the development of a storm south of the Gulf states, where this area was probably central. The p. m. report of the 10th placed the centre of this disturbance in the Rio Grande valley near to and northeast of Brownsville, and succeeding reports indicated the advance of this storm to the northward immediately toward the high area, which then extended over the Lake region. This storm moved northerly until the centre reached a point near Omaha on the afternoon of the 11th and then moved to the northeast. Heavy rains fell on the 11th and 12th in the Mississippi and the Ohio valleys and Lake region, and severe gales occurred at the Lake stations as the centre passed from northern Iowa over Lake Superior. Cautionary signals were displayed at all stations on the lakes in advance of this storm. The maximum velocities as reported were as follows: Milwaukee, 45 miles; Grand Haven, 40 miles; Alpena, 42 miles. The above wind velocities indicate the severity of the storm in the Lake region. The Cautionary signal at Chicago was not justified at this station, the highest velocity which occurred during the storm, being 22 miles per hour; but vessels attempting to leave this port were compelled to return. This depression advanced rapidly to the Lower St. Lawrence valley during the 12th and 13th, followed by clearing, colder weather in the Mississippi valley and light rains in the Lake region and the Middle states. The barometer continued to fall at the centre as this storm advanced to the east, and when last observed on the morning of the 14th the pressure was 29.43 inches at Anacosti, with the wind reported as a gale from the west.

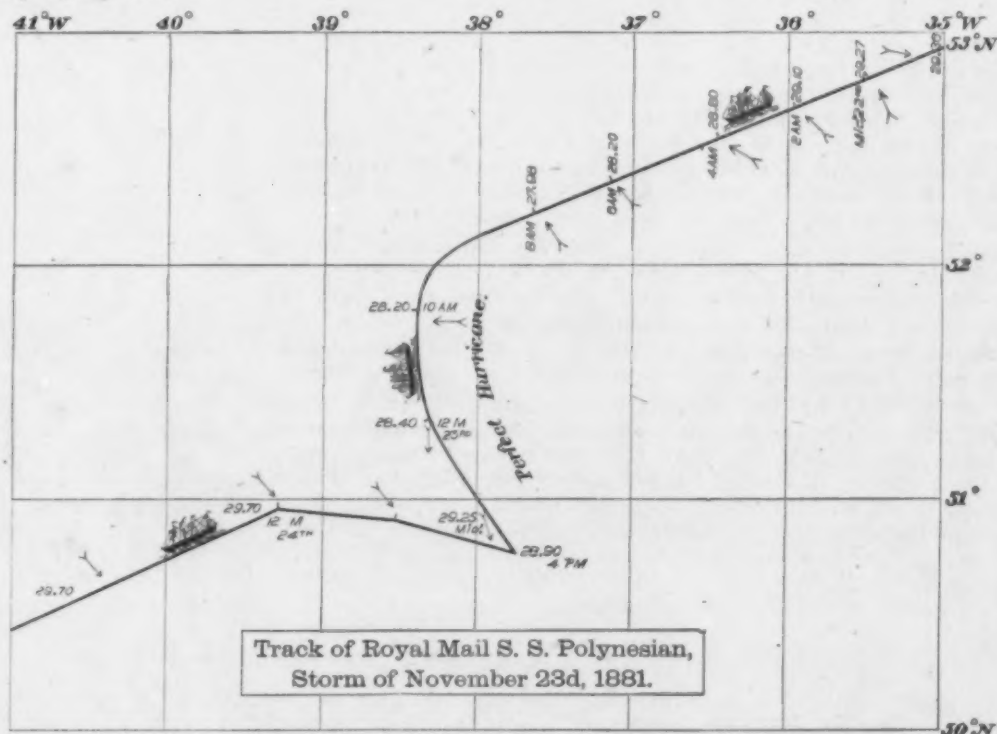
No. VIII.—The a. m. report of the 14th indicated the presence of this depression off the North Pacific coast, the barometer at Portland then reading 29.43 inches. The midnight report of the 14th showed that threatening weather and rain had extended as far south as San Francisco, and that all winds on this coast had veered to southerly. This depression probably crossed the Rocky Mountains, but the chart of barometric departures indicated that two depressions existed in this region on the morning of the 14th, and the one in advance, has been traced continuously for each telegraphic report, and therefore marked as a separate storm.

No. IX.—Central in the Saskatchewan region at midnight of the 14th the storm passed southeastward, following the course of the Missouri valley until the a. m. report of the 16th, when the centre of disturbance was located near Yankton. From this point the course changed to the northeast, and during the 17th this storm increased in energy as it passed over the Lake region and thence to the eastward. The increase of pressure in the western quadrants was very rapid, and the temperature fell from 20° to 30° in the Northwest. This storm continued its easterly movement after leaving the Lake region, but became much enlarged as it approached the northeastern coast. The lowest reading of the barometer observed was 29.12 inches at Anacosti on the afternoon of the 18th, when the stations on the Atlantic coast north of Cape Hatteras were within the limits of this depression, the winds being from brisk to high and from the southwest at stations along the coast.

No. X.—This storm developed in Texas during the night of the 17th, and was central near Denison on the morning of the 18th, the isobar of 29.90 inclosing the area and forming an elongated ellipse with the longer axis pointing in the direction of the storm movement. This de-

pression was forced rapidly to the east by the high area which was advancing from the Upper Missouri valley. The rush of cold air from the north caused a marked depression in temperature at stations on the eastern slope of the Rocky Mountains on the morning of the 18th. The 3 p. m. report of this date shows temperatures of 77° at Memphis, 33° at Fort Gibson, 56° at St. Louis and 25° at Leavenworth. Very heavy rains fell on the 18th, in Missouri, Illinois, Indiana and Kentucky, causing damaging floods in the tributaries of the Ohio. Snow and sleet continued in the northern districts during the 19th, as this storm centre passed over New York and New England. The winds increased in force on the Lower Lakes near the centre of disturbance and on the Middle Atlantic coast after shifting to the northwest. The highest velocities reported were as follows: Sandusky, 48 miles from the west; Delaware Breakwater, 40 to 52 miles during the 36 hours ending at 7 a. m., November 20th. The following reports, furnished through the co-operation of the New York Herald Weather Service, indicate the presence of this storm as it passed eastward over the ocean. S. S. *Gallia*, 20th, 7. a. m., in 45° 13' N., 44° 31' W., 29.75, W., force 5, high WNW. sea, overcast and rain; noon, in 45° 02' N., 45° 03' W., 29.70, SW., force 5, high WNW. sea, overcast and heavy rain. 21st, 7. a. m., in 43° 55' N., 48° 19' W., 30.15, NNW., force 8, cloudy weather, stormy gales and hail; noon, in 43° 40' N., 49° W., 30.22, NNW., force 8, high gales and hard squalls with hail. S. S. *Wyoming*, 20th, 7. a. m., in 47° 30' N., 41° 50' W., 29.60, NNW., force 7, confused sea, overcast and cloudy; 3 p. m., in 47° N., 44° W., 29.10, ESE., force, 4, confused sea, gloomy weather, sleet and snow. 21st, 7 a. m., in 45° 45' N., 47° 25' W., 30.00, W., force 9, overcast and cloudy; 3 p. m., in 45° 20' N., 48° 58' W., 30.13, WSW., force 7, overcast and cloudy. S. S. *City of Chester*, 21st, 10.26 a. m., in 50. 34' N., 25° 20' W., 28.20, SSW., force 9, high confused sea, dark cloudy weather with thunder and lightning; at 1.20 p. m., wind suddenly shifted in a terrific squall from SW. to NW., and blew with hurricane force for three hours. 22d, 10.10 a. m., in 50° 15' N., 29° 40' W., 29.40, W., force 7, partly cloudy weather. 23d, 9.50 a. m., in 49° 10' N., 44° 20' W., 27.97, SW., force 12, dark heavy clouds with violent squalls of rain and hail. 24th, 9.40 a. m., in 49° N., 36° 30' W., 29.62, W., force 10, partly cloudy weather with violent squalls of rain and hail. S. S. *Italy*, 24th, in 48° 34' N., 31° 50' W., hurricane from N. to NW., barometer fell from 29.60 to 28.20.

Nos. XI and XII.—Were observed in the region north of Dakota on the 26th and 22nd and moved directly east, north of the Lake region, causing slight changes in the atmospheric conditions over the United States. No. XI developed great energy as it approached the Newfoundland coast. Violent gales occurred at Father Point, Yarmouth and in the Atlantic east of these stations. This storm probably continued its easterly course over the Atlantic as is indicated by the reports from the steamship *Polynesian* on the 23d in the latitude and longitude given in the accompanying chart:



The track of this vessel with the direction of the wind and the readings of the barometer are also

given on this chart as reported. The Chief Signal Officer takes this occasion to express his high appreciation of the valuable reports and diagrams furnished by Commander R. Brown of the "Allan" Royal Mail S. S. *Polynesian*. No. XII passed to the east off the coast on the 24th as a severe storm, the barometer at Sydney falling as low as 29.14 and that at Anacosti to 29.19. The following report taken under the direction of Commander Jules Ueberweg of the S. S. *Nederland* of the Red Star Line, indicates that this storm continued its easterly course over the Atlantic to 51° N., 22° W. This vessel was five days in passing from longitude 23° to longitude 30°. The following observations were taken on this vessel during the storm:

Date.	Wind.	Course.	Distance.	Lat.	Long.	Bar.	Temp.	Remarks.
Nov. 27th.....	WNW.	{ S. 86° 27', W.	{ 210 miles.	30° 57'	22° 52'	29.13	43°	Violent and terribly high sea.
Nov. 28th.....	NW.			30° 35'	21° 36'	29.57	42°	Violent and terribly high sea.
Nov. 29th.....	NW. to WSW.			30° 47'	21° 55'	29.18	45°	Stormy and boisterous; furious high sea.
Nov. 30th.....	WSW. to NW.			30° 45'	25° 46'	29.40	44°	Stormy and boisterous; furious high sea.
Dec. 1st.....	WNW.			30° 47'	26° 57'	29.40	45°	Wind and sea abating gradually.

The following reports furnished through the co-operation of the New York Herald Weather Service, indicate the presence of this storm as it passed eastward over the ocean. S. S. *Wyoming*, 24th, 7 a. m., in 41° 26' N., 63° 46' W., 29.38, SW., force 7, high westerly sea, gloomy weather and rain; 3 p. m., in 41° 05' N., 65° 40' W., 29.42, WNW., force 6, overcast and rain. 25th, 7 a. m., in 40° 30' N., 69° 08' W., 30.08, WNW., force 7, partly cloudy weather. S. S. *Gallia*, 24th, 7 a. m. in 41° 52' N., 66° 17' W., 29.40, S., force 4, overcast and rain; noon, in 41° 45' N., 67° 40' W., 29.30, NW., force 4, cloudy weather and rain.

No. XIII.—Appeared in the Gulf of Mexico, south of the mouth of the Mississippi river, on the afternoon of the 22d. This storm became well defined, and passed northeast over Florida, causing high winds in the East Gulf. Signals were ordered for stations on the Atlantic coast as far north as Norfolk, but the depression either filled up or passed rapidly to the east off the South Atlantic coast, causing but slight disturbances at stations between Cape Hatteras and Jacksonville. The signals ordered for stations on the Gulf coast were justified; those ordered for Jacksonville, Savannah, Charleston and Wilmington were not justified at the stations. A vessel attempted to leave port at Jacksonville but was compelled to return.

No. XIV.—First observed in British America northwest of Ft. Garry on the 24th, and by the morning of the 25th it had moved southeastward to Lake Superior, causing high winds and snow in the Lake region. On the morning of the 26th the centre of disturbance was north of Lake Ontario, but generally fair weather continued in the districts on the Atlantic coast and south of the Lake region. This storm was followed by a slight depression, which developed into a severe storm in the St. Lawrence valley on the night of the 27th. The rapid advance of high area No. VII from the Hudson Bay region, caused a rapid increase in the barometric gradient to the west of the centre of this secondary storm, and high westerly winds were reported from Sydney, Yarmouth, and other stations in that region. The following reports furnished through the co-operation of the New York Herald Weather Service indicate the presence of this storm as it passed eastward over the ocean: S. S. *Italy*, 26th, in 47° 44' N., 38° 15' W., 29.10, heavy westerly gale, with squalls and very high sea. 27th, in 47° 09' N., 41° 03' W., heavy NNW. gales, slightly abating, with hail squalls and cloudy weather. S. S. *Republic*, (?) 26th, in 51° N., 24° 15' W., 28.56, WSW., force 11, terrific storm, violent squalls and high sea. 27th, in 50° 35' N., 26° 34' W., 29.31, WNW., force 10, terrific gale, violent squalls and high sea.

No. XV.—Advanced from the Upper Missouri valley on the afternoon of the 27th, but probably originated west of the Rocky Mountains. The centre of this storm passed far to the north of the Lake region, but the southern half of the depression included within its limits all districts north of Tennessee and Virginia. As the centre passed to the east the weather continued fair, except at extreme northern stations, with rising temperature and south to east winds.

No. XVI.—Developed in the Southwest on the 29th, and after passing over the Mississippi valley and Lake region as an area of rain and snow it was central north of Lake Erie at the close of the month. The temperature fell below freezing in the Rocky Mountain regions as far south as El Paso, as this storm moved to the east of the Mississippi. Cautionary off-shore signals were ordered on the 30th for Indianola and Galveston in anticipation of the light norther, which occurred in Texas on Dec. 1st.

INTERNATIONAL METEOROLOGY.

International charts Nos. IV and V accompany the present REVIEW. The former is published for September, 1879, and continues the series of this chart commenced in January, 1877. chart No. V is prepared for the month of December, 1879, and continues the series of this chart commenced in November, 1877.

Chart No. IV shows the mean pressure, temperature and the prevailing direction of the wind at 7.35 a. m., Washington or 0.43 p. m. Greenwich mean time, for the month of September, 1879, over the Northern and at certain isolated stations in the Southern Hemisphere. Two areas of mean barometric minima appear upon the chart for the present month, one (29.40) over Greenland and Iceland and the other (29.80) on the western coast of Africa in the vicinity of 8° N., 13° W. The former shows the lowest monthly mean pressure that has been recorded at Stykkisholm for the past three years. From the prevailing direction of the winds at Godthaab and Stykkisholm it would appear likely that a still lower mean pressure than that reported at Stykkisholm obtained in the vicinity of 70° N. During this month no less than seven storms, most of them displaying great energy, passed northeastward over the ocean between Greenland and the British Isles, entering Europe on the coast of Norway. The second area of low mean pressure presents even more unusual features of interest than does the first. As a rule the mean barometer along this portion of the western coast of Africa very rarely falls below 29.90 or 29.85, while at Free Town this month, the anomalous mean barometer of 29.75 is reported. At no time during the month did the daily reading at this station rise above 29.79 or fall below 29.67. The usual area of low mean pressure in Hindostan is for the present month, 29.70, although in northwestern Bengal and the Punjab the monthly mean is about 29.60. Elsewhere throughout the Northern Hemisphere the pressure is generally 30.00 or above. There are two principal areas of high mean pressure, 30.30 in the vicinity of the Azores and 30.20 in central Russia. Both of these areas embrace circumscribed regions; the former is a gradual increase of 0.06 to 0.10 inch over the mean of August, while the latter resulted from a decided increase of 0.25 to 0.40 inch over that month. The area of 30.10 over the Atlantic covers an immense region between the parallels of 20° and 50° N., and the meridians of 10° and 75° W., and as compared with the previous month of August is an enlargement of more than double its former proportions. The extreme mean pressures for the month are 29.38 (lowest) at Stykkisholm and 30.27 (highest) at Punta Delgado. The extreme monthly range of mean pressure is 0.89 inch, which is 0.33 inch larger than September, 1877, and 0.20 inch larger than September, 1878. The following extreme monthly mean temperatures are given in Fahrenheit's scale: *lowest*, Godthaab, 35° ; York Factory, 38° ; Stykkisholm, 43° ; Moose Factory and Nikolaievsk, on the Amoor, 47° ; Yeniseisk, 49° ; *highest*, Biskra, 92° ; Lahore, 90° ; Athens and Murcia, 83° ; Manilla, 82° . The prevailing direction of the winds over the United States, was *northeasterly* throughout the Atlantic states from southern Florida to New England; in the Gulf states, *northeast to southeast*; in the Lake region, *southwest to northwest*; in the Northwest and Upper Missouri valley, *northwesterly*; in the Lower Missouri valley and westward to the Rocky Mountains, *southerly*; in the Plateau and Pacific coast regions, *southwest to northwest*. Over Canada and the Maritime provinces, *southwest to northwest*. In central Mexico, *northeast to northwest*. Over the Atlantic ocean, *northeast to southeast* south of parallel 40° N., and to the northward of that parallel, *northeast to southwest and northwest*. In Europe, *southwesterly* over the British isles and Scandinavia and thence southeastward to the central portions of France and Germany, beyond which the winds over the remainder of Europe prevail from the *northeast, southeast and northwest*, modified by a strong tendency to *variable* in Spain and Italy. In Algeria the winds are *northwesterly*. In Hindostan, *westerly* along the western coast, elsewhere *variable*. Along the Asiatic coast and over the Japan islands, *northerly*. Compared with September, 1877 and 1878, the temperature over the United States is generally lower over the western portions, but susceptible of little change east of the 100th meridian. The pressure is decidedly higher between the 80th and 100th meridians; elsewhere little or no variation. Over the Atlantic, where comparison can only be made with 1878, the regions of highest pressure between the parallels of 20° and 50° N. show an increase of from 0.05 to 0.20 inch. Northward of 50° N. there appears a decrease pressure of from 0.05 to 0.30 inch. The temperature southward of 50° N. shows but little if any change, except in a narrow belt north of 45° N., where a fall of from 1° to 2° occurs. Northward of the 50th parallel the fall continues with greater positiveness. In the various countries of Europe the following changes appear: over the British isles the pressure is from 0.01 to 0.20 inch lower, while the temperature shows but little variation. In Scandinavia the pressure is generally higher, ranging from 0.01 to 0.25 inch; the temperature is from 3° to 6° higher. In Denmark the change in pressure is a plus quantity showing a variation of from 0.10 to 0.15 inch, while the temperature is from 5° to 10° higher. In France there is a general but comparatively slight rise in pressure and a small minus variation in temperature. In Germany and Austria there is a general rise in pressure of from 0.05 to 0.10 inch; the temperature in both countries shows a rise of from 2° to 6° . In Italy there is a rise in pressure of from 0.01 to 0.05 inch and of temperature from 1° to 4° . In Spain and Portugal there is a rise in pressure of from 0.01 to 0.05 inch and a general fall in temperature. In Russia the rise in pressure is more decided than in any other country of Europe, being an increase of from 0.15 to 0.35 inch; the temperature is everywhere higher, generally from 3° to 10° . In Hindostan the pressure is considerably higher along the western coast; elsewhere lower; the temperature is generally higher north of the Ganges, lower to the southward, and showing but little if any change along the western coast. In Algeria the pressure is generally higher, while the temperature shows a condition quite the reverse. The accompanying

table shows the deviations in temperature and barometer at isolated stations for the month of September, 1879, as compared with the means of the past two years:

Comparative Thermometric and Barometric Means, with corresponding Departures.

STATION.	Mean Temperature.			Mean Barometer.			STATION.	Mean Temperature.			Mean Barometer.		
	Sept., 1877-78.	Sept., 1878.	Departure.	Sept., 1877-78.	Sept., 1878.	Departure.		Sept., 1877-78.	Sept., 1878.	Departure.	Sept., 1877-78.	Sept., 1878.	Departure.
York Factory	36.1	37.5	+1.4	29.84	30.09	+0.25	Bridgetown	83.1	83.2	+0.1	29.92	29.95	+0.03
Godthaab	59.8	34.6	-25.2	29.73	29.69	-0.04	Navassa	83.4	82.5	-0.9	29.91	29.96	+0.05
Stykkisholm	45.6	43.2	-2.4	29.71	29.38	-0.33	Medellin	68.9	66.9	-2.0	.....	.....	.....
Tromsø	46.5	50.8	+4.3	29.62	29.63	+0.01	San Jose de Costa Rica	67.6	68.0	+0.4	.....	.....	.....
Thorshavn	50.8	49.9	-0.9	29.81	29.55	-0.26	Mexico	55.4	54.7	-0.7	30.18	30.10	-0.08
Archangel	48.9	52.3	+3.4	29.69	30.01	+0.32	Melbourne	52.5	53.6	+1.1	30.04	30.01	-0.03
Ekaterinburg	52.2	52.3	+0.1	29.81	30.04	+0.23	Hobart Town	51.1	50.9	-0.2	29.85	29.90	+0.05
Barnaul	59.1	55.4	-3.7	29.88	29.90	+0.02	San Juan de Puerto Rico	81.0	81.9	+0.9	29.91	29.99	+0.08
Yeniseisk	51.0	48.9	-2.1	29.83	30.04	+0.21	Nassau	84.3	82.0	-2.3	29.95	30.02	+0.07
Nikolayevsk, on the Amoor	50.9	46.9	-4.0	.....	.....	.....	Havana	82.1	81.2	-0.9	29.93	29.97	+0.04
Zi-Ka-Wei	69.4	71.6	+2.2	29.94	29.91	-0.03	Astrakhan	70.9	69.3	-1.6	29.95	30.12	+0.17
Tokel	69.7	68.0	-1.7	29.90	29.92	+0.02	Athens	83.2	83.0	-0.2	29.83	29.98	+0.15
Pekin	69.0	66.7	-2.3	29.96	29.96	Norm'l	Lahore	92.2	89.8	-2.4	29.63	29.62	-0.01
Tashkent	69.6	67.5	-2.1	30.00	30.01	+0.01	Tiflis	77.3	74.6	-2.8	29.80	29.98	+0.18
Nukuss	76.7	72.9	-3.8	29.93	30.08	+0.15	Laghouat	83.7	85.3	+1.6	30.04	30.02	-0.02
Beirut	85.1	85.0	-0.1	29.85	29.85	Norm'l	Fort de France	81.5	80.1	-1.4	29.84	29.97	+0.13
Mauritius	74.6	72.5	-2.1	30.13	30.17	+0.04	Yokohama	69.8	69.9	+0.1	29.91	29.91	Norm'l
Fort Napier .....	.....	.....	.....	.....	.....	.....	Lisbon	73.8	69.1	-4.7	30.00	30.13	+0.13
Cape Town	64.6	64.7	+0.1	30.14	30.13	-0.01	Madrid	77.8	74.7	-3.1	.....	.....	.....
Free Town	82.1	80.8	-1.3	29.98	29.75	-0.23	Cagliari	79.1	79.4	+0.3	29.91	29.98	+0.07
Paramaribo	83.4	82.0	-1.4	30.07	30.03	-0.04	Gibraltar .....	.....	.....	.....	29.97	30.03	+0.06
Funchal	76.2	74.7	-1.5	30.07	30.16	+0.09	Sandwick Manse	53.4	53.8	+0.4	29.87	29.75	-0.12
Ponta Delgado	73.3	74.2	+0.9	30.16	30.27	+0.11	Malta	88.6	81.4	-7.2	29.93	29.94	+0.01
Angra	69.9	71.1	+1.2	30.14	30.26	+0.12	.....	.....	.....	.....	.....	.....	.....

Chart No. V.—This chart displays the tracings of the probable courses of thirty-four of the principal storm areas of the Northern Hemisphere for the month of December, 1879. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data which reaches this office in various ways from the logs of vessels of the merchant marine of the North Atlantic and North Pacific oceans. Concerning the general distribution of the paths of the areas of barometric minima the following is given: nineteen areas traversed portions of the United States, eight of which came from the Pacific ocean; eleven reached the Atlantic ocean, five of which crossed the same to the mainland of northern Europe. Two areas crossed British Columbia from the Pacific. One area first appeared over Hudson's bay and passed northeastward into northern Greenland. Another area developed over the Atlantic ocean near the Azores. One area first appeared in southwestern Europe, two in extreme northern Europe, one in southern Russia and one in western Siberia. Six areas formed over the seas bordering the Asiatic coast. Of the storms in North America the following descriptions are given: No. I.—This area formed in the Lower Missouri valley as the result of a general depression over the northern territories. Accompanied with snow and high northerly winds the storm passed northeastward to southern Michigan and thence, with increased rapidity, to the Canadian Maritime provinces, where the area became central on the morning of the 4th. During the day the depression passed off the coast of Newfoundland and on the following morning was central in about 50° N., 50° W. On this day the depression nearly disappeared under the influence of two high areas, 30.20 and 30.40, the former northeast of the Azores and the latter over New England. During the 6th as the latter rapidly advanced the former slowly receded, resulting finally in a division of the now, narrow and elongated depression, which reached from Iceland southwestward to about 40° N., 40° W. The southern arm of the depression passed southeastward to the Azores and thence eastward along the 40th parallel to the meridian of 20° W., when its course changed to northerly the depression disappearing near parallel 50° N. The lowest readings, reported during the progress of this subsidiary area occurred on the 9th at Angra and Ponta Delgado, 29.00 and 29.34 respectively, winds south. The northern arm passed northward to Iceland where on the 7th it became central off the western coast; Stykkisholm, 29.27, a fall of 0.39 inch in past 24 hours, wind SW., force 8, rain. 8th, depression central off the northwestern coast of Norway; Tromsø, 29.32, a fall of 0.65 inch, SW., rain; Stykkisholm, 30.04, a rise of 0.77 inch, NE., force 6, snow. 9th, central over Lapland; Tromsø, 28.92, a fall of 0.40 inch, SW., snow; Haparanda, 29.36, a fall of 0.37 inch, W., fair; Archangel, 29.08, a fall of 0.45 inch, drifting snow. 10th, central north of parallel 60° N., and between the meridians of 50° and 60° E.; Archangel, 29.22, a rise of 0.14 inch; during the day the depression remained about stationary, owing to the presence of a high area over southwestern Siberia, and on the 11th gradually filled up over the western portion of that country. No. II.—This area formed off the North Pacific coast region on the 1st and passed northeastward over British Columbia, affecting decidedly the pressure over the northern territories, from the influence of which area No. I resulted. The further course of area No. II. in the British Possessions could not be traced, owing to lack of reports. No. VI.—This area appearing off the North Pacific coast on the 2nd, soon followed the disappearance of area No. II. On the

3rd was central in southern Idaho, with rain or snow, quite general in the Middle Plateau region. During the day passed southeastward over Utah, and thence eastward into Colorado, where, on the 4th, it was central, the area 29.80, embracing the country from Washington territory eastward to Minnesota and southward to include Texas. 5th, depression central in the Lower Missouri valley, with greatly increased energy. During the day passed northeastward to the Upper Lake region, where it was central on the 6th with still greater energy; lowest barometer at Marquette 29.25, a fall of 0.63 inch, wind SE., snow. 7th, central over northern Canada in the vicinity of 50° N., 80° W.; Moose Factory, 29.34, a fall of 0.20 inch, wind shifted from S. to NW., with heavy snow. During the 7th and 8th, the course of the depression, as indicated upon the chart, is rather doubtful, owing to the lack of sufficient reports. It seems very probable, however, that the depression passed to the north of Godthaab, as shown by the following observations made at that station: 7th, 29.72, calm; 8th, 29.40, SSE., snow; 9th, 29.44, SW., cloudy; 10th, 29.91, calm, snow. During the 9th, depression disappeared under the influence of a high pressure area, 30.20, then prevailing off the west coast of Iceland. No. VIII.—This area formed off the North Pacific coast on the 6th and passed southeastward over Washington territory, and the Northern and Middle Plateau regions to Colorado, where it was central on the morning of the 7th. Snow, with high northwest winds, accompanied the depression in the Plateau regions. During the 7th the depression passed southeastward into Texas, where it dissipated by the following morning under the influence of a high pressure area from the Northwest which advanced rapidly southeastward. No. IX.—During the 7th the barometer fell quite rapidly over northern California with heavy rain and gales along the Middle Pacific coast, followed later in the northern portions of California and Nevada by heavy snow. 8th, central in the Middle Plateau region, Salt Lake barometer 0.66 inch below the normal. During the day the depression passed eastward to western Kansas and Nebraska preceded by fresh to brisk southeast to southwest winds with rain and snow eastward to Lake Erie. 10th, central over Lake Superior with greatly increased energy, lowest barometers at Duluth and Marquette, 29.16 and 29.17, respectively, winds southwest. During the day the depression advanced rapidly northeastward over Canada, being central on the morning of the 11th in about 50° N., 70° W., where the central area appeared to be inclosed by the isobar of 29.40. On this day and the following the depression passed eastward south of Greenland. The following observations taken at Godthaab, Greenland, show the influence of the depression during its approach and passage: 11th, 29.77, ENE.; 12th, 29.01, ENE.; 13th, 29.21, NNE.; 14th, 29.33, SW. The following observations were taken at Stykkisholm: 11th, 29.84, S., rain; 12th, 29.56, S., cloudy; 13th, 29.23, S., rain; 14th, 29.16, SW., snow; 15th, 29.34, SW., snow. On the 14th the depression was probably central in about 70° N., 5° E.; Tromsø, 28.96, a fall of 0.52 inch, SW., rain; Bronø, 29.40, SW., rain. 15th, central over Lapland; Tromsø, 28.87, W., snow; Haparanda, 29.28, W., clear; Archangel, 28.98, a fall of 0.72 inch, W., fair. 16th, central in about 60° N., 50° E.; Archangel, 29.24, WNW., drifting snow; Ekaterinburg, 29.10, a fall of 0.76 inch, WSW.; Kasan, 29.28, a fall of 0.54 inch, W. 17th, central in the valley of the Obi near 60° N., 70° W.; Ekaterinburg, 29.34, WNW.; Kasan, 29.71, NW.; to the eastward, in the provinces of Tomsk and Yeniseisk, the barometer fell slowly, winds shifting to easterly with snow. 18th, central with increased energy in the northern portion of the province of Tomsk; Barnaul, 29.80, a fall of 0.35 inch, SW., snow; Yeniseisk, 29.85, a fall of 0.16 inch, SSE. 19th, Yeniseisk, 29.71, S.; Barnaul, 29.91, SW., heavy snow. During the day the depression probably disappeared in a high pressure area 30.60, then prevailing over northern China. No. X.—This area formed over the Northern Plateau on the 9th, and by the following morning became central in eastern Utah, inclosed by the isobar of 29.80. During the 10th the depression lost its identity over southern Colorado, under the influence of a high pressure area 30.40, which passed rapidly southeastward from Manitoba in rear of area No. IX. No. XI.—Following the passage eastward of the previously mentioned high area, this depression formed in the Saskatchewan valley on the 12th, and passed southeastward into Wyoming, where it became central on the following morning. During the day the depression passed southward into western Kansas disappearing on the 14th over northern Texas. High westerly winds and snow were reported from central Colorado on the 13th; Pike's Peak, NW., 56 miles. No. XII.—This area formed over the western portion of the Gulf of Mexico on the 13th, accompanied by northerly gales and rain along the Texas coast. 14th, depression central in the vicinity of New Orleans, with no decided fall in the barometer at coast stations. From Mississippi northward to the Lakes and northeastward to New England, northeasterly winds with rain or threatening weather prevailed. During this day the depression passed rapidly northeastward over the Southern States, and by the morning of the 15th, was central in the Lower St. Lawrence valley, inclosed by the isobar of 29.60. Light rain or snow, with northeast to southeast winds, prevailed in New England and the Canadian Maritime provinces, followed on the 16th by winds changing to west and northwest, with clearing weather but falling barometer, as the central depression passed eastward to the Gulf of St. Lawrence. During the day depression passed eastward over Newfoundland, followed by winds shifting to southwest and northwest, with rapidly rising barometer. 17th, depression central in about 50° N., 45° W.; in 44° 53' N., 51° 04' W., WSW. to WNW.; fresh to strong gales, hard squalls, high sea; in 43° 12' N., 57° 39' W., strong NW. gales, hard

squalls, heavy sea; in $43^{\circ} 46' N.$, $54^{\circ} 22' W.$, W. strong, heavy hail squalls, high sea; in $53^{\circ} 40' N.$, $29^{\circ} 50' W.$, barometer 29.43, wind S., force 6, cloudy. 18th, depression about stationary; in $49^{\circ} 06' N.$, $31^{\circ} 54' W.$, westerly gales, stormy, high sea; in $48^{\circ} 07' N.$, $34^{\circ} 44' W.$, W. to N., moderate gale, heavy head sea; in $48^{\circ} 21' N.$, $39^{\circ} 08' W.$, moderate gale, heavy head sea. On the following day the depression moved very slowly northward combining on the 22nd with area No. XX then central southwest of Iceland. On the 21st a trough of low pressure extended from Iceland southwestward to Newfoundland embracing the supposed centres of areas No. XII and No. XX. No. XIV.—This area developed on the North Carolina coast as a subsidiary depression during the passage northeastward of area No. XII on the 14th. During the day it passed northeastward along the Middle Atlantic and New England coasts accompanied by northeasterly gales and rain and on the 15th became central off the southern coast of Maine, lowest barometer at Eastport, 29.52, a fall of 1.19 inches in past 24 hours. On this day the two areas, Nos. XII and XIV, moved in parallel courses northeastward, the former being central in the Lower St. Lawrence valley. On the 16th the two areas combined in the Gulf of St. Lawrence followed over New England and in the western portion of the Canadian Maritime provinces with clear or partly cloudy weather and occasional snow. In the eastern portion of the latter region, stormy weather still prevailed; lowest barometer at St. John's and St. Pierre, Newfoundland, 29.14 and 29.12, respectively, winds W.; Sydney, N. S., 29.26, SW. Severe southwest to northwest gales with heavy sea were experienced over the ocean north of parallel $40^{\circ} N.$ and between the meridians of 50° and $70^{\circ} W.$ No. XVI.—Following the passage southeastward of an area of 30.40 from the Saskatchewan valley, the barometer on the 15th fell quite suddenly over the northern Rocky Mountain region accompanied by southeast to southwest winds, light rain and snow. During the day this depression passed southeastward into Nebraska, where it was central on the morning of the 16th. On this day heavy westerly winds with snow were experienced in the central Rocky Mountain region: Pike's Peak, W. 62 miles; Cheyenne, W. 50 and Virginia City, W., 32. During the day the depression passed eastward with great rapidity, but diminishing energy, over the Lake region to New England, being central in the latter district on the morning of the 17th. By the following morning the central area passed off the Nova Scotia coast, losing its identity in an extensive area of 29.80 prevailing over the ocean from Greenland southward to parallel $40^{\circ} N.$ and thence southeastward to near the Cape Verde Islands. No. XVIII.—This area developed on the 17th over the Middle Plateau, forming an irregular elongated area of about 29.90, running from northern Montana southward to northern Arizona and thence southeastward down the valley of the Rio Grande. By morning of the 18th this large and irregular depression was considerably contracted by the descent southward of a high pressure area, 30.30, which cut off its eastern extremity and confined the central area to the region of its incipient stages. The area was now inclosed by the isobar of 29.80 and accompanied by northerly winds and snow on its northern border. During the 18th the depression lost its identity owing to the rapid advance of area No. XIX moving eastward from the Middle Pacific coast. No. XIX.—On the 18th while area No. XVIII, covered the Middle Plateau the pressure began to diminish along the California coast so that by the following morning an area of 29.60 (lowest barometer at Sacramento, 29.58, a fall of 0.40 inch) embraced the northern portion of the state. An elongated area of 29.80 extended from the Middle Pacific coast eastward to the Lower Missouri valley. On the 20th the depression was central in the Middle Plateau, lowest barometer at Winnemucca, 29.50, S., light rain. 21st, central in Wyoming, lowest barometer at Cheyenne, 29.45, a fall of 0.17 inch. On this day the area of 29.80 extended from British Columbia southeastward to Texas. 22d, central with diminished energy over Lake Huron. The area of precipitation covered the entire Lake region and thence eastward to the Atlantic. During the day this depression rapidly dissipated over Canada, under the influence of two areas of high pressure, 30.60 covering the western portion of the Canadian Maritime provinces and 30.30 in the Lower Missouri valley. No. XX.—This depression appeared on the 19th in the southern portion of the Upper Lake region and moved rapidly northeastward over the Lower Lakes, accompanied by rain or snow and fresh to brisk southwesterly winds. During the 20th passed southward off the Nova Scotia coast, and then again to the northeast, being central on the 21st with greatly increased energy in the vicinity of $50^{\circ} N.$, $50^{\circ} W.$ 21st, in $48^{\circ} 50' N.$, $46^{\circ} 40' W.$, 29.36, SW., force 6, heavy sea, threatening; in $46^{\circ} 58' N.$, $45^{\circ} 55' W.$, heavy westerly gales, with violent squalls; in $45^{\circ} 21' N.$, $44^{\circ} 30' W.$, strong SW. to W. gales, high sea; in $49^{\circ} 29' N.$, $35^{\circ} 32' W.$, W. and SW. strong gales, squally, heavy head sea; in $49^{\circ} 33' N.$, $32^{\circ} 36' W.$, NW. strong, snow and hail squalls, high W. sea; in $51^{\circ} 08' N.$, $48^{\circ} 30' W.$ NE. to NW. moderate gale. During the 21st depression passed rapidly northeastward, being central on the 22d in about $60^{\circ} N.$, $30^{\circ} W.$ Although the central area of low on this day was situated far to the north, yet the influence of the depression was still evident southward to parallel $45^{\circ} N.$, as shown by the following reports, where the violence exhibited is largely due to the advance eastward of an area of 30.60 over the Gulf of St. Lawrence. In $45^{\circ} 30' N.$, $50^{\circ} 18' W.$, WNW. heavy gale, dense snow squalls; in $48^{\circ} 34' N.$, $37^{\circ} 33' W.$, rain and hail, with high westerly winds; in $48^{\circ} 29' N.$, $39^{\circ} 43' W.$, NW. and W. hard gale, very heavy head sea; in $44^{\circ} N.$, $47^{\circ} 49' W.$, strong W. and SW. gales, with very high sea. During the approach and passage of the storm the following observations were

made at Stykkisholm, Iceland: 20th, 29.60, S.; 21st, 29.15, E.; 22d, 29.39, E.; 23d, 28.85, SE., rain and hail; 24th, 29.50, NE., cloudy. After rounding Iceland to the northward, the depression was central on the 24th over the ocean northwest of Norway; Tromsø, 29.04, SW., cloudy; Bronø, 29.27, SW., rain; Thorshavn, 29.35, W., force 6. 25th, depression central east of the White sea; Archangel, 28.85, a fall of 0.18 inch, NW., snow; over central Russia the winds shifted to southwest with rapidly falling pressure and snow. 26th, central in eastern Russia; Kasan, 29.31, SW., cloudy; Ekaterinburg, 29.45, WSW., cloudy. 27th, central northeast of the Caspian sea; over central and eastern Russia winds shifted to north and northeast with rising barometer and snow; lowest barometer at Astrakhan, 29.79, a fall of 0.12 inch, NE., cloudy. During the day depression disappeared in a high pressure area prevailing over Toorkistan. No. XXI.—This depression first appeared to the northwest of Hudson's bay on the 18th, when the barometer at York Factory fell from 30.17 to 29.99, and the wind shifted from east to southeast. 19th, depression central north of York Factory, barometer 29.50, S., snow; 20th, 29.67, SW., clearing. It is rather difficult to trace the course of the depression after the 19th, owing to the entire absence of reports over that portion of North America north of parallel 60° N. But the influence exerted upon the surrounding pressure at Godthaab, Greenland, appears to be of such a nature and degree that it would seem a safe judgment to trace the area as indicated upon the chart. The following observations were made at Godthaab: 18th, 29.34, ENE.; 19th, 29.22, ENE.; 20th, 29.09, calm; 21st, 29.17, SE.; 22d, 29.30, ENE.; 23d, 29.75, NW. On the 23d this depression combined with area No. XX, then central off the western coast of Iceland. No. XXIV.—While area No. XIX was central in Wyoming and before a complete recovery of pressure took place over the Middle Plateau, the barometer began again to fall and by the morning of the 22d an area of 29.60 was central in Utah. During the day the depression moved southeastward into Arizona; the area of 29.80 extended from Montana southward to Mexico and thence eastward along parallel 30° N. to central Texas. Owing to the rapid descent of a high pressure area 30.80, from the British possessions the depression disappeared in northern New Mexico during the 23d. No. XXV.—This depression of slight energy appeared off the Middle Atlantic coast on the 22d forming as a subsidiary area to No. XIX then central in the Upper Lake region. During the day it moved rapidly northeastward along the coast accompanied by northeasterly gales and rain. 23d, central south of Newfoundland; lowest barometer at St. Pierre, N. F., 29.83, wind, S., force 5, stormy; in 44° 05' N., 55° 40' W., 29.98, SSE., force 6, rain. During the day disappeared in a high pressure area, 30.40, prevailing near 40° N., 50° W. No. XXVII.—This area appeared in central Texas on the 23d, resulting in part from the division of the elongated depression of 29.80 which marked the peculiar of area No. XXIV on this day. The division of this depression by the descent of a high pressure area as heretofore noted in the description of area No. XXIV was instrumental in the rapid movement northeastward of area No. XXVII, which by morning of the 24th was central over the Lower Lakes, accompanied by heavy precipitation. During the day it moved down the valley of the St. Lawrence, being central on the morning of the 25th over Newfoundland, thereafter combining with area No. XXIX, which had approached northeastward from the northern portion of the Middle Atlantic states. No. XXIX.—This area appeared over southern New England on the 24th, while area No. XXVII was central in the Lower Lake region. During the day it moved rapidly northeastward to Newfoundland, where it was central morning of the 25th. St. Pierre, N. F., 29.49, a fall of 0.71 inch, wind shifted from NW. to SW.; St. John's, N. F., 29.56, a fall of 0.46 inch, wind shifted from NW. to S., with rain. During the day the depression passed eastward to about 50° N., 40° W., where it was central on the 26th; in 40° 45' N., 38° 20' W., 29.43, NW., force 5, drizzling; in 41° 40' N., 54° 10' W., NNE., force 4 rain; in 51° 26' N., 36° 42' W., 28.81, a fall of 0.72 inch, WSW., force 10, very heavy sea, cloudy; 49° 04' N., 42° W., strong westerly gales throughout the day; in 49° 32' N., 36° 58' W., very heavy west gales with dangerous sea; in 47° 39' N., 35° 47' W., W. to NW. strong gale, high sea; in 48° 13' N., 33° 47' W., WNW. gale, high sea, heavy rain and violent squalls. As the depression passed northeastward to Iceland, very heavy W. to NW. gales, with snow squalls, prevailed over the ocean between 45° and 60° N., and 25° and 45° W. 27th, depression central over Iceland, with greatly increased energy, and very sharp barometric gradients southward to the British isles. The area of 29.60 extended from 50° N., 40° W. northeastward to Norway, covering the northern portion of the British isles. Over the latter the southerly winds had increased to gales, with velocities ranging from 25 to 60 miles per hour, and accompanied by fierce squalls of rain and snow; the barometer fell from 0.25 to 0.60 inch in past 24 hours. The following observations were reported from Stykkisholm: 24th, 29.50, NE., force 6; 25th, 29.31, SE., force 8, rain; 26th, 29.00, SW., force 6, snow squalls; 27th, 27.98, calm, the lowest barometer reading of the month, and also for a period many years, at this station; 28th, 28.62, NE. force 7, snow squalls; 29th, 29.08, E., force 8. In 47° 06' N., 45° 50' W., strong WNW. gale throughout day, with thick snow squalls and hard frosts at night; in 48° 24' N., 41° 27' W., heavy westerly gale and high sea; in 57° N., 19° W., hurricane from SW. to NW., with frightful sea; S. S. *Silesia*, from Hamburg to New York, when about 600 miles west of Queenstown, experienced tremendous hurricane from 27th to 31st; in 50° 54' N., 26° 23' W., SW. to WNW. moderate gale, high sea; in 51° 22' N., 20° 30' W., SW. and W. strong gales, hard squalls. 28th, depression central

north-northeast of the Faroe islands; Thorshavn, 29.04, W., force 6; North Unst, 29.23 W., force 8; Sandwick Manse, 29.42, SW., 24 miles, rain; Valencia, 29.71, SSW., 52 miles, rain; Brono, 28.98 a fall of 1.02 inches, SW., rain and snow; Tromso, 28.93, a fall of 0.89 inch, SW., fair; Christiania, 29.46, a fall of 0.98 inch, S., cloudy; Hernosand, 29.44, a fall of 0.93 inch, S., cloudy. The area of precipitation extended southward from parallel 70° N. to parallel 45° N. and between the meridians of 30° E. and 10° W. As the depression passed eastward the pressure rose slightly over the Faroe islands with winds shifting to NW., but over the Shetland and Orkney islands it fell considerably with steady westerly winds. 29th, depression central in northern Scandinavia: Brono, 28.74, S., snow; Tromso, 28.73, SW., cloudy; Christiania, 29.06, WSW., threatening; Bergen, 29.35, WSW., 1.17 inches rain-fall in past 24 hours. The lowest pressures on this day were reported from northern Sweden: Hernosand, 28.69, calm, cloudy; Umea, 28.80, S., cloudy; Upsala, 28.80, SW., cloudy; Stockholm, 28.95, NW., cloudy; Haparanda, 29.06, SE., cloudy. The area of precipitation now moved eastward into central Russia, with winds shifting to south and southeast. During the day the depression moved slowly northward with diminished energy. The further progress of the area eastward was prevented by the exceedingly high pressures over central Siberia (30.80) and western Russia (30.40.) 30th, Tromso, 28.77, a rise of 0.04 inch, SW.; Brono, 28.88, a rise of 0.14 inch, SW., rain and snow; Haparanda, 28.98, a fall of 0.08 inch, calm; Umea, 29.03, a rise of 0.23 inch, SW., cloudy; Hernosand, 29.06, a rise of 0.37 inch, SW., clear; Archangel, 29.41, a fall of 0.26 inch, ESE., cloudy. 31st, central with greatly diminished energy over northern Lapland; Tromso, 28.91, SW., fair; Haparanda, 29.13, SSE., fair; Archangel, 29.52, ESE., cloudy. During the day the depression gradually filled up in the vicinity of parallel 70° N. This storm proved to be the most violent of the month and was accompanied by the lowest barometric readings. No. XXX.—For four days previous to the appearance of this depression the barometer had been high in the Northwest and Saskatchewan valley, ranging from 30.20 to 30.80, but by morning of the 26th, a small area of 29.80 appeared in northern Dakota, accompanied by southerly winds and occasional light rains. 27th, central in the Upper Missouri valley, with heavy gales to the south and west: Pike's Peak, SW., 56; Dodge City, SW., 45; Cheyenne, W., 44 miles. 28th, central in the Lower Missouri valley, Leavenworth barometer 0.70 inch below the normal. During the day the depression moved rapidly northeastward in a narrow barometric trough over the Upper Mississippi valley to the Lower Lakes, where it was central morning of the 29th. During the day it moved rapidly northeastward down the St. Lawrence valley, being central on the morning of the 30th, northeast of Newfoundland. 30th, in 49° 35' N., 46° 20' W., 29.39, a fall of 0.90 inch, SW., heavy gales with rain; in 47° 50' N., 48° 30' W., 29.66, a fall of 0.64 inch, SW., heavy gales, threatening. During the day the depression passed rapidly northeastward south of Iceland, and on the morning of the 31st was central just west of the Faroe islands with a barometric trough of 29.00 extending southwestward from northwestern Norway over Iceland to near 50° N., 40° W. The following observations were reported from Stykkisholm, Iceland, during the approach and passage of the storm: 19th, 29.08, E., force 8; 30th, 28.90, E., force 6; 31st, 28.86, E., force 2; January 1st, 28.39, NE., force 6, snow; 2nd, 29.21, N., force 8 snow. It will be observed at the commencement of these observations that the pressure at Stykkisholm had recovered from the extraordinary influence of area No. XXIX. Thorshavn, 29th, 29.15, NW., force 2; 30th, 28.95, SE., force 6; 31st, 29.09, SW., force 2; January 1st, 28.64, S., force 6, rain. North Unst, 29th, 29.07, W., force 7; 30th, 29.17, SE., force 6; 31st, 29.19, W., force 7. The further course of this depression will appear on the January chart, 1880. No. XXXI.—This depression of slight energy first appeared in the Northern Plateau district on the 28th, while area No. XXX was central in the Lower Missouri valley. 29th, central in the Middle Plateau, lowest pressure at Salt Lake City, 29.77, calm, light snow. southerly winds with light rain prevailed in western Arizona and northerly winds with light snow in Colorado and Wyoming. By morning of the 30th the depression had disappeared in an area of high pressure, 30.20, over New Mexico, which increased to 30.40 to the east and northeast. No. XXXII.—This area appeared morning of the 30th in the Saskatchewan valley and during the day moved thence southeastward to Lake Superior being central to the northward on the 31st. The depression as yet displayed but slight energy owing probably to the very high pressures to the south and east, 30.40, in the Middle slope and Lower Missouri valley, and 30.70 in the Middle Atlantic states, New England and Lower St. Lawrence valley. The further course of this area will appear on the January chart, 1880. No. XXXIV.—This area advanced from the Pacific ocean in parallel 50° N., and was central over British Columbia on the 31st. Its further course will probably appear on the January chart, 1880. Of the storms forming over the Atlantic ocean but one has been traced for the present month, concerning which the following brief description is given: No. III.—This area apparently resulted from a slight depression which on the 29th and 30th of November occupied the ocean south of parallel 40° N., and between the meridians of 30° and 50° W.; On December 1st, the barometer at Angra, read 29.50, a fall of 0.38 inch, wind shifted from E. to W., 0.80 inches rainfall in past 24 hours; Ponta Delgado, 29.57, a fall of 0.49 inch, wind shifted from ESE. to SW., 1.60 inches rainfall in past 24 hours. 2d, depression central in about 45° N., 15° W., thereafter pursuing a southeasterly course to the northwestern coast of Spain where, on the morning of the 3rd, it was central with greatly increased

energy. On this day the lowest barometer reported occurred at Santiago, 28.81, a fall of 1.24 inches in past 48 hours or of 0.84 inch in past 24 hours, wind SSW., stormy; 1.23 inches rainfall in past 24 hours. Lisbon, 29.20, a fall of 0.52 inch, SW., 40 miles, 0.70 inch rainfall in past 24 hours. Pressure over Spain fell generally from 0.20 to 0.80 inch. During the day the depression curved to the northeast with slowly diminishing energy, being central morning of the 4th, on the western coast of France; Tours, 29.08, a fall of 0.57 inch, E., stormy; Rochefort, 29.06, a fall of 0.41 inch, S., cloudy; Bourges, 29.09, a fall of 0.65 inch, SSE., cloudy; Lorient, 29.00, a fall of 0.48 inch, NE., force 8, cloudy. On this day ten stations in France reported snow with northeasterly winds; the winds throughout that country were generally from NE. to SE., with the barometer ranging from 29.00 to 29.60. During the day the depression moved rapidly eastward along parallel 50° N. and by morning of the 5th was central in southern Germany; lowest barometer at Leipsic, 29.31, a fall of 0.45 inch, ENE., heavy snow. Violent northeast to southeast and westerly gales with snow prevailed throughout Germany. Southeast to southwest and northwest winds with rain prevailed throughout Austria and Hungary. 6th, depression central north of the Black Sea; Lugan, 29.35, a fall of 0.19 inch, ESE., cloudy; Nikolaiev, 29.56, N., cloudy; Kieff, 29.58, NE., cloudy. 7th, gradually disappeared in a high pressure area over the Caspian sea. Concerning the storms in Europe the following descriptions are given: No. IV.—This area is traced as a continuation of No. XXIV of the November chart. Central morning of the 1st in Hungary; lowest barometer at Pola, 29.30, E., force 6, rain; snow was reported, with northeasterly winds, from Szathmar and Trieste, and with a west wind from Agram. On this day a narrow barometric trough, of 29.50, extended from the eastern extremity of the Black sea westward to include northern Italy. 2d, depression central north of the Black sea; Lugan, 29.43, SSW., cloudy; Nikolaiev, 29.30, SW. rain; Kieff, 29.34, NE. snow. During the day the depression passed rapidly northeastward, and on the morning of the 3d was central in about 55° N., 55° E.; Kasan, 29.14, a fall of 0.87 inch, SW. cloudy; Krotkovo, 29.33, a fall of 0.60 inch, SW., cloudy; Ekaterinburg, 29.90, a rise of 0.18 inch, SSE., snow; Archangel, 29.66, a fall of 0.40 inch, NE. cloudy. 4th, depression central east of the White sea; Archangel, 29.14, NE., snow; Kasan, 29.73, SSW., fair; Ekaterinburg, 29.35, WSW., fair; 5th, depression about stationary; Archangel, 29.58, N., fair; Kasan, 29.73, S., fair; Ekaterinburg, 29.87, SW., fair. During the 6th and 7th the depression passed slowly eastward to the valley of the Yenisei; on the 6th there was a fall of 0.41 inch at Barnaul and on the 7th of 0.65 inch at Yeniseisk, wind SE., snow; wind shifted to SW., with snow at Barnaul. 8th, depression probably disappeared in an area of high pressure (30.30 over southern Siberia. No. V.—This depression is a continuation of area No. XXVII of the November chart. Central on the 1st in the valley of the Obi, it was accompanied by easterly winds and snow. 2nd, central in the valley of the Yenisei, with rapidly diminishing energy and during the day disappeared in an area of 30.30 in central Siberia. No. XIII.—This depression formed over Lapland on the 13th as the result of an elongated area of barometric minima extending from southern Greenland northeastward to northern Scandinavia, accompanying the advancement of area No. IX then central west of Iceland. 13th, Tromso, 29.48, a fall of 0.42 inch, SW., cloudy, 1.10 inches rainfall in past 24 hours; Haparanda, 29.50, a fall of 0.78 inch, SE., cloudy; Archangel, 29.43, a fall of 0.92 inch, SSW., heavy snow drift. 14th, depression central in about 60° N., 60° E.; Archangel, 29.70, WNW., cloudy; Kasan, 29.88, a fall of 0.50 inch, WSW., snow; Ekaterinburg, 29.55, a fall of 0.82 inch, SW., cloudy. 15th, central in about 60° N., 80° E.; Ekaterinburg, 29.86, W., fair; Barnaul, 29.69, fall of a 0.15 inch, NW., snow; Yeniseisk, 29.86, a fall of 0.37 inch, clear. By morning of the 16th the depression had lost its identity owing to the rapid advance and superior energy of area No. IX, then central near the White sea. On this day the barometer rose rapidly to 30.10 at Yeniseisk and 30.21 at Barnaul. No. XVII.—This depression appeared on the 17th over the White sea as an auxiliary area to No. IX then central in the valley of the Obi. On that day a narrow barometric trough of 29.00 ran southeastward from Lapland, inclosing the centre of area No. XVII, while the isobar of 29.40 inclosed that of area No. IX. 17th, Archangel, 29.88, a fall of 0.36 inch, SW., cloudy. 18th, depression central in about 60° N., 60° E.; Archangel, 29.57, NW., fair; Kasan, 29.25, a fall of 0.46 inch, NW., fair; Ekaterinburg, 29.16, a fall of 0.18 inch, SW., cloudy. 19th, central in the valley of the Obi, with diminishing energy; Ekaterinburg, 29.51, W., fair. 20th and 21st, depression about stationary but with decreasing pressure, finally disappearing east of the Yenisei on the 22d. This depression probably reached the Asiatic coast, as the pressure on the following day was below 29.70 eastward to Nikolaievsk on the Amoor. No. XXVI.—This depression of slight energy appeared north of the Caspian sea on the 22nd; Krotkovo, 29.80, N., light snow; Kasan, 29.82, NNW., cloudy; Ekaterinburg, 29.63, calm, cloudy. 23rd, central in about 55° N., 75° E.; Ekaterinburg, 29.91, NW., clear; Barnaul, 29.69, a fall of, 0.25 inch, SE., snow; Tashkend, 29.94, a fall of 0.12 inch, winds lifted from N. to W. 24th, passed eastward south of Yeniseisk, barometer 29.70, a fall of 0.17 inch, W., cloudy; Barnaul, 29.82, a rise of 0.13 inch, SW., cloudy. By morning of the 25th had disappeared in an area of 30.30, over southern Siberia. Concerning the storms off the Asiatic coast, the following descriptions are given. No. VII.—This depression first appeared south of the Island of Formosa and moved thence northeastward, being central on the 6th near the Island of Kinsin; Nagasaki, 29.88, a fall of 0.14 inch, wind shifted from N. to S., with heavy rain; in 28°

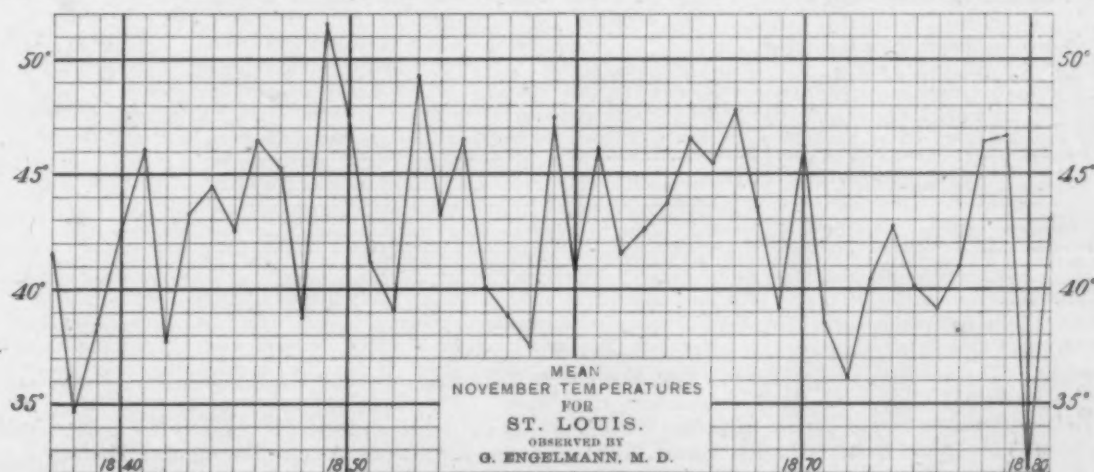
27° N., 127° 18' E., 30.08, NNW., heavy gale, high sea; Hiroshima, 29.76, a fall of 0.28 inch, wind shifted from NNE to SW., gloomy weather; Tokei, 29.87 a fall of 0.29 inch, wind shifted from NNE. to NNW., cloudy, 0.88 inch rainfall in past 24 hours; Wakayama, 29.73, a fall of 0.29 inch, wind shifted from NE. to SE. 7th, depression probably central off the northeastern coast of the Island of Nippon; lowest barometer at Tokei, 29.60, a fall of 0.27 inch, SW., clear; Yokohama, 29.65, a fall of 0.27 inch, W., clear; Waykayama, 29.84, W., clear; Hiroshima, 29.88, W., rain; Nagasaki, 30.10, W., rain. During the day the depression disappeared to the eastward over the ocean, followed morning of the 8th by clear weather and rising pressure at all stations. No. XV.—On the 14th the barometer at Nagasaki fell from 0.15 to 0.20 inch, followed on the morning of the 15th by winds shifting from W. to NW., with heavy rain. The pressure at most Japanese stations had fallen from 0.10 to 0.15 inch, with northeasterly winds. 16th, depression probably central off the southeastern coast of Nippon; Tokei, 29.72, a fall of 0.37 inch, NW., rain, 1.73 inches rainfall in past 24 hours; at other Japanese stations the barometer rose from 0.01 to 0.23 inch, with clearing weather and winds shifting to northwesterly. This depression was too far south of the coast to produce decided effect at land stations. No. XXII.—On the 18th, the barometer at all Japanese stations fell from 0.06 to 0.21 inch, followed on the 19th by winds shifting to easterly, with cloudy weather and rain. By morning of the 20th the depression passed eastward south of Tokei, the barometer at that station having fallen 0.24 inch, wind shifting from NE. to NNW., with clearing weather. The barometer at other stations, except Wakayama, rose from 0.07 to 0.11 inch, with winds shifting to northeasterly. No. XXIII.—The presence of this depression to the southwestward was forestalled on the 20th at western stations by the shifting of the winds from northwest to northeast, with slowly rising pressure, while at Wakayama, Yokohama and Tokei (eastern stations) the winds shifted from northeast to northwest, with falling pressure under the influence of departing area No. XXII. By morning of the 21st the barometer at all Japanese stations had fallen from 0.02 to 0.12 inch, with northeast to northwest winds and light rain at Nagasaki. 22nd, lowest barometer at Tokei, 29.69, a fall of but 0.01 inch, NNW., clear. Nagasaki remained stationary, while the barometer at other stations fell from 0.03 to 0.04 inch; the winds at all stations shifted to northerly, with clear or fair weather. By morning of the 23d the barometer at all stations, except Nagasaki, had risen from 0.04 to 0.10 inch, with winds shifting to northwesterly; the probable position of the area was indicated by the following ships report: in 37° 10' N., 161° 32' E., 29.54, NW., force 4 to 6, high westerly gales, heavy sea and rain. This depression was too far south to produce decided effect at land stations. No. XXVIII.—The position of this depression as charted on the 23d is very much in doubt, although the southeasterly winds, with falling pressure at Manilla would probably indicate its presence south of the Island of Formosa. By morning of the 24th the barometer at Nagasaki had fallen slightly, wind changed from WNW. to calm. At Hiroshima the barometer fell 0.02 inch, wind NNE., clear; Tokei, rose 0.04 inch, wind shifted from NNW. to NE.; Wakayama, rose 0.01 inch, wind continued from the E. 25th, Hiroshima, barometer stationary, wind shifted from NNE. to NNW, light rain; Nagasaki, rose 0.08 inch, wind N.; Tokei, 29.55, a fall of 0.38 inch, wind shifted from NE. to SSW.; Wakayama, fell 0.16 inch, wind shifted from E. to NNW, light rain. By morning of the 26th, the barometer at Japanese stations had risen from 0.15 to 0.58 inch, winds shifting to northeasterly, with clear or fair weather. On this day the depression was probably central in about 37° N., 150° E., as shown by the following ship's report: in 35° 50' N., 150° 24' E., 29.35, SSW., force 7, high southwesterly sea, heavy rain. This vessel, on the 25th, in 36° 10' N., 154° 57' E., reported a barometer of 30.08, wind SW., force 4; in moving east about 4° she experienced a fall in pressure 0.73 inch, with wind increasing to a gale. The probable position of the depression on the 27th is again indicated by the ship's report as follows: in 35° 48' N., 148° 09' E., 29.48, N., force 9, high north sea, heavy rain. 28th, in 25° 22' N., 145° 55' E., 29.85, N., force 6, high NNW. sea, heavy rain. No. XXXIII.—By morning of the 28th the barometer at Nagasaki had fallen from 30.09 to 29.86, wind shifted from SE. to WNW., with light rain. At Hiroshima the barometer had fallen 0.43 inch, wind shifted from NNE. to ESE., with rain; Tokei, fell 0.23 inch, wind shifted from ESE. to NNE., with moderately heavy rain; Wakayama, fell 0.48 inch, wind shifted from NNW. to E., with moderately heavy rain. 29th, Tokei, 29.34, a fall of 0.65 inch, SSE., cloudy; Wakayama, 29.56, a fall of 0.16 inch, NW., fair; Hiroshima, 29.73, a fall of 0.03 inch, W., cloudy; Nagasaki, 29.97, a rise of 0.11 inch, NW., cloudy; in 34° 53' N., 142° 55' E., 29.41, SSW., force 6, high west sea, cloudy. 30th, Tokei, 29.32, a fall of 0.02 inch, SW., clear; Wakayama, 29.67, a rise of 0.11 inch, WNW., cloudy; Hiroshima, 29.81, a rise of 0.08 inch, WNW., cloudy; Nagasaki, 29.98, a rise of 0.01 inch, WNW., rain; in 35° 02' N., 140° 42' E., 29.30, WNW., force 6, high west sea, rain squalls. 31st, the barometer at all Japanese stations rose from 0.11 to 0.24 inch, winds shifted from SW. and WNW. to N. and NNE., with clear or partly cloudy weather; lowest barometer at Yokohama, 29.42, rising on the following day to 29.90, wind W. During the day the depression disappeared to the eastward over the ocean.

TEMPERATURE OF THE AIR.

The mean temperature of the air for November, 1881, is shown by the isothermal lines (in red) on chart No. II. The table of mean and comparative temperatures in the right hand corner of the chart shows, in the first column, the average for the month through-

out the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month, and the departures of such means from the average for many years. East of the 97th meridian the temperature is everywhere above the normal, except in Minnesota and the Western Gulf states, the departures of excess ranging in the extremes from $0^{\circ}.7$ in the Missouri valley to $5^{\circ}.6$ in the Florida peninsula. The Western Gulf states report a normal condition, while Minnesota shows a deficiency of $1^{\circ}.1$. Westward to the Pacific the temperature is everywhere below the normal, except in the Northern Rocky Mountain slope, where there is an excess of $0^{\circ}.7$. Throughout this extensive stretch of territory the departures of deficiency range in the extremes from $0^{\circ}.4$ in the Middle Rocky Mountain slope to $2^{\circ}.4$ in the Middle Pacific coast region. Larger deficiencies were reported from isolated stations, $4^{\circ}.5$ at Salt Lake City and $3^{\circ}.1$ on the summit of Pike's Peak. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1872, together with the corresponding districts: 1873, $-7^{\circ}.0$ New England and $-5^{\circ}.5$ Minnesota; 1874, $+4^{\circ}.8$ Gulf states and $+3^{\circ}.9$ Ohio valley and Tennessee; 1875, $-6^{\circ}.0$ St. Lawrence valley, $-5^{\circ}.3$ Minnesota and $+5^{\circ}.7$ Gulf states; 1876, $-4^{\circ}.5$ Lower Missouri valley, and $+3^{\circ}.1$ Lower Lake region; 1877, $+7^{\circ}.3$ Minnesota, and $+6^{\circ}.1$ New England; 1878, $+13^{\circ}.7$ Upper Missouri valley, and $+12^{\circ}.4$ Minnesota; 1879, $+5^{\circ}.1$ Western Gulf states and $+4^{\circ}.6$ Ohio valley and Tennessee; 1880, $-12^{\circ}.4$ Rio Grande valley and $-11^{\circ}.8$ Southeast Rocky Mountain slope.

Deviations from Mean Temperature.—Under this heading departures exhibited by reports from the regular Signal Service stations are shown in the table of comparative temperatures on the right-hand side of chart No. II. The following items of importance in connection with this subject are reported by voluntary observers: *Illinois*: Riley, mean temperature 0.5° above that for the past 20 years; mean temperature of autumn of 1881, $3^{\circ}.5$ higher than the average of this season for the past 20 years; only the years 1865 and 1870 were warmer than 1881, while the mean of 1867 was just equal. *Kansas*: Lawrence, mean temperature $1^{\circ}.56$ above the mean of past 13 years. Yates Centre, mean temperature $11^{\circ}.5$ above that of 1880. Wellington, mean temperature $3^{\circ}.05$ above the average for past two years. *Maine*: Gardiner, mean temperature $1^{\circ}.52$ above the mean of the past 45 years. *Maryland*: Fallston, mean temperature $4^{\circ}.8$ above the mean of the past 10 years. *Missouri*: St. Louis, Missouri Weather Service reports the mean



temperature $0^{\circ}.4$ above the mean of the past 45 years. *New Hampshire*: Contoocookville, mean temperature $38^{\circ}.5$ or $4^{\circ}.5$ above the mean of past 10 years. *New Jersey*: Newark, mean temperature $2^{\circ}.73$ above the average for the past 38 years; highest mean, $49^{\circ}.7$ in 1849; lowest mean, $36^{\circ}.1$ 1873; mean temperature of autumn $5^{\circ}.3$ above the average of past 38 years; warmest autumn $56^{\circ}.32$ occurred in 1850; coldest autumn $50^{\circ}.77$ occurred in 1875. *New York*: North Volney, mean temperature $2^{\circ}.8$ above that of the past 13 years; highest monthly mean, $38^{\circ}.8$ occurred in 1877; the lowest, $29^{\circ}.5$ occurred in 1873; mean temperature of autumn $4^{\circ}.54$ above the mean of this season for past 13 years; the autumn of 1881 has been the warmest on record. Palermo, mean temperature $1^{\circ}.3$ below that of the past 28 years; warmest November, temperature $41^{\circ}.8$ occurred in 1859; coldest November, temperature $26^{\circ}.8$ occurred in 1873. Waterburg, mean temperature, $4^{\circ}.61$ above the mean of the past 10 years. *Ohio*: North Lewisburg, mean temperature $12^{\circ}.5$ above that of 1880 and $2^{\circ}.6$ above the mean of the past 50 years. Cleveland, mean temperature $11^{\circ}.27$ above that for 1880 and $2^{\circ}.6$ above the mean of the past 27 years; highest mean during that period $44^{\circ}.53$ occurred in 1859; lowest mean $31^{\circ}.91$ occurred in 1880. *Virginia*: Wytheville, the following report is made by Mr. Howard Shriver, voluntary observer: "like the four preceding months, November has been warmer than the average. Not

only so, but its average temperature has been higher and it may hence be regarded as a warmer month than any November in the past 17 years, by values varying from 1° to 9°. As might be expected, its warmest day showed a higher marking than any day of the previous 17 Novembers, with one exception, in the year 1879, when the mercury rose 6° higher than any day of the present month. It seems strange, in this connection, to find that only three (1872, 1873 and 1879) of the preceding Novembers had colder days than the present month." *West Virginia: Helvetia*, mean temperature 9°.11 above that for 1880 and 4°.01 above the mean of the past 5 years.

Table of Maximum and Minimum Temperatures for November, 1881.

State or Territory.	Signal Service.			U. S. Army Post Surgeons or Voluntary Observers.			State or Territory.	Signal Service.			U. S. Army Post Surgeons or Voluntary Observers.		
	Station.	Max.	Min.	Station.	Max.	Min.		Station.	Max.	Min.	Station.	Max.	Min.
Alabama.....	Mobile.....	81°		Auburn.....		19°	Minnesota.....	St. Paul.....	57°		Northfield... ..	56°	
Do.....	Montgomery.....		23°				Do.....	St. Vincent.....	-15°		Fayette.....		23°
Arizona.....	Yuma.....	83°		Maricopa.....	86°		Mississippi.....	Vicksburg.....	80°	25°	Sedalia.....		76°
Do.....	Prescott.....		12°				Missouri.....	St. Louis.....	72°	15°	Oregon.....		4°
Arkansas.....	Little Rock.....	71°	25°	Mt. Ida.....	56°	16°	Do.....	Ft. Benton.....	63°		Ft. Shaw.....		-19°
California.....	Campos.....	73°	16°	Summit.....		1°	Do.....	Ft. Assinaboine.....		-18°	Lincoln.....	74°	
Do.....	Denver.....	69°					Do.....	& Ft. Shaw.....	67°	-5°	Colconda.....	83°	
Colorado.....	Pike's Peak.....	-12°		Southington.....	70°	13°	Nebraska.....	North Platte.....	61°	5°	Boon.....		-24°
Connecticut.....	New Haven.....	66°	17°	Ft. Randall.....	75°		Nevada.....	Winnemucca.....			Conteococky.....		67°
Dakota.....	Ft. Sully.....	68°		Ft. Stevenson.....		-22°	Do.....	Do.....		-15°	Vineland.....	78°	
Do.....	Ft. Stevens n.....		-21°				New Hampshire.....	Mt. Wash'ton.....	47°		Atco.....		19°
Delaware.....	Breakwater.....	73°	26°	Residing Reservoir.....	39°		Do.....	Sandy Hook.....	73°		Port Union.....		-5°
Dist. Columbia.....	Washington.....	76°	21°	Ft. Barrancas.....	19°		Do.....	Atlantic City.....	72°				
Florida.....	Key West.....	88°					New Mexico.....	La Mesilla.....	78°				
Do.....	Pensacola.....		28°	Quitman.....	28°		Do.....	Silver City.....		15°			
Georgia.....	Augusta and Savannah.....	81°					New York.....	Rochester.....	70°		Ft. Niagara.....	71°	
Do.....	Atlanta.....	30°					Do.....	Oswego.....		13°	Madison Barracks.....		-2°
Idaho.....	Ft. L'pwai.....	64°					North Carolina.....	Wilmington.....	81°		Highlands.....		8°
Do.....	Eagle Rock.....		-1°				Do.....	Charlotte.....		26°	Portsmouth.....	80°	
Illinois.....	Calro.....	72°		Genesee.....	75°		Ohio.....	Columbus.....	72°		Bellefontaine.....		11°
Do.....	Champaign.....		11°	Elmira.....		3°	Do.....	Cleveland.....	72°	15°			
Indiana.....	Indianapolis.....	63°	10°	Vetay.....	73°		Oregon.....	Umatilla.....	70°	20°			
Indian Ty.....	Ft. Sill.....	75°					Pennsylvania.....	Pittsburg.....	76°		Dyberry.....		8°
Do.....	Ft. Supply.....		12°				Do.....	Erie.....		17°			
Iowa.....	Keokuk.....	65°		Cresco.....		-1°	Rhode Island.....	New Shoreham.....	70°				
Do.....	Davenport.....						Do.....	Newport.....		30°	Aiken.....		22°
Do.....	Dubuque & Des Moines.....		6°				South Carolina.....	Charleston.....	80°	28°			
Kansas.....	Leavenworth.....	70°	11°	Ft. Scott.....	76°		Tennessee.....	Knoxville.....	81°	15°			
Kentucky.....	Louisville.....	74°	10°	Bowling Green.....	73°	15°	Texas.....	Uvalde.....		91°			
Louisiana.....	New Orleans.....			Pt. Pleasant.....	81°		Do.....	Mason.....		19°			
Do.....	& Port Eads.....	80°					Utah.....	Salt Lake City.....	56°	13°	Charlotte.....	65°	
Do.....	Shreveport.....		25°				Vermont.....	Burlington.....	65°	3°	Newport.....		-7°
Maine.....	Portland.....	61°		Dexter.....		-4°	Do.....	Cape Henry.....	79°				
Do.....	Eastport.....		3°				Do.....	Lynchburg.....		24°			
Maryland.....	Baltimore.....	71°	24°	Federalburg & Woodstock.....	77°		Washington Ty.....	Altaota and.....					
Do.....				Emmitsburg.....	16°		Do.....	Pomeroy.....	62°				
Massachusetts.....	Boston.....	71°		Heath.....		4°	Do.....	Spokane.....	76°	26°	Helvetia.....		14°
Do.....	Springfield.....		13°				Do.....	Morgantown.....	60°	2°	Manitowoc.....	63°	
Michigan.....	Detroit.....	69°		Lansing.....	67°		Wisconsin.....	La Crosse.....	70°	5°	Nellisville.....		-2°
Do.....	Marquette.....		8°	Ft. Brady.....		-5°	Do.....	Cheyenne.....	56°	9°	Ft. Fetterman.....	63°	
							Wyoming.....				Ft. Bridger.....		-7°

Ranges of Temperature at Signal Service stations.—Monthly ranges in general varied from 45° to 65° over the country east of the Rocky Mountains and from 35° to 55° westward to the Pacific. The *smallest* ranges were: San Francisco, 22°; Key West and Olympia, 25°; Red Bluff, 28°; Portland, Or., 29°; San Diego and Port Eads, 38°; Pike's Peak and Sacramento, 39°. The *largest* were: Rock Creek, Mont., 88°; Ft. Sully, 79°; Ft. Buford, 78°; Forts Stevenson and Benton, 77°; Bismarck, 76°; Ft. Shaw, 75°; Helena, 72°; Fort Assinaboine and Huron, 71°. The *daily* ranges varied in the different districts as follows: New England, 22° at New Shoreham to 34° at Boston and Eastport; Middle Atlantic states, 19° at Albany and 21° at Cape May to 29° at Lynchburg and 31° at Washington; South Atlantic states, 23° at Kittyhawk, Macon, Smithville and Charleston to 30° at Augusta and Jacksonville; Florida peninsula, 12° at Key West to 25° at Cedar Keys; East Gulf states, 21° at New Orleans to 31° at Vicksburg, Mobile, Montgomery and Pensacola; West Gulf states, 21° at Port Eads to 38° at Denison and 39° at Mason; Rio Grande valley, 35° at Laredo, Brackettville and Castroville to 38° at Uvalde; Ohio valley and Tennessee, 23° at Columbus and 24° at Indianapolis to 32° at Knoxville and 38° Nashville; Lower Lake region, 22° at Oswego to 26° at Cleveland, Buffalo and Rochester; Upper Lake region, 20° at Grand Haven and 24° at Port Huron to 30° at Duluth and 31° at Alpena; extreme Northwest, 41° at Moorehead to 48° at Bismarck and 52° at Fort Buford; Upper Mississippi valley, 24° at Keokuk to 33° at St. Louis and 37° at St. Paul; Missouri valley, 31° at Ft. Bennett to 35° at Huron and 43° at Omaha; Southern slope, 36° at Jacksboro' to 46° at McKavett and 47° at Concho; Middle slope, 40° at Dodge City to 42° at Denver; Northern slope, 33° at Cheyenne to 41° at Ft. Keogh and North Platte; Northern plateau, 27° at Boise City to 32° at Missoula and 36° at Eagle Rock; Middle plateau, 25° at Salt Lake City to 36° at Winnemucca; Southern Plateau, 40° at Silver City to 46° at La Mesilla and Phoenix and 48° at Tucson; South

Pacific region, 30° at San Diego to 37° at Yuma and Los Angeles and 39° at Visalia; Middle Pacific region, 15° at San Francisco, to 28° at Sacramento and 34° at Red Bluff; North Pacific region, 18° at Olympia, to 21° at Portland and 22° at Roseburg.

Table of Comparative Minimum Temperatures for the month of November.

State or Territory.	Minimum for November, 1881, Signal Service.		Lowest since Signal Service stations were opened—3 to 10 years.			Lowest from any other source.		
	Station	Temp.	Station.	Temp.	Year.	Place.	Temp.	Length of Record.
Alabama.....	Montgomery.....	25°	Montgomery.....	26°	'77, '80	Huntsville.....	13°	9 years.
Arizona.....	Prescott.....	12°	Prescott.....	-1°	1880	Fort Whipple.....	-1°	9 "
Arkansas.....	Little Rock.....	25°	Little Rock.....	10°	1880	Fort Smith.....	6°	21 "
California.....	Campo.....	16°	Campo.....	17°	1880	Fort Bidwell.....	9°	11 "
Colorado.....	Pike's Peak.....	-12°	Pike's Peak.....	-36°	1880	Fort Garland.....	-35°	30 "
Connecticut.....	New Haven.....	17°	New Haven.....	2°	1875	New Haven.....	2°	87 "
Dakota.....	Ft. Stevenson.....	-21°	Pembina.....	-40°	1874	Colebrook.....	-10°	18 "
Delaware.....	Delaware Breakwater.....	36°	Delaware Breakwater.....	23°	1880	Fort Buford.....	-37°	16 "
Dist. of Columbia.....	Washington.....	21°	Washington.....	12°	1880	Delaware City.....	13°	4 "
Florida.....	Pensacola.....	28°	St. Marks.....	27°	1877	Washington.....	12°	49 "
Georgia.....	Atlanta.....	26°	Atlanta.....	25°	1880	Ft. Barrancas.....	19°	59 "
Idaho.....	Eagle Rock.....	-1°	Lewiston.....	7°	1880	Atlanta.....	10°	7 "
Illinois.....	Champaign.....	11°	Champaign.....	-3°	1880	Fort Hall.....	-12°	4 "
Indiana.....	Indianapolis.....	10°	Indianapolis.....	-5°	1880	Augusta.....	-12°	19 "
Indian Territory.....	Ft. Supply.....	12°	Ft. Gibson.....	-16°	1880	Indianapolis.....	4°	18 "
Iowa.....	Davenport, Dubuque and Des Moines.....	6°	Dubuque.....	-9°	1875	Fort Gibson.....	0°	52 "
Kansas.....	Leavenworth.....	11°	Dodge City.....	-7°	1880	Independence.....	-17°	18 "
Kentucky.....	Louisville.....	19°	Louisville.....	8°	1880	Fort Leavenworth.....	-14°	51 "
Louisiana.....	Shreveport.....	23°	Shreveport.....	18°	1880	Newport Barracks.....	-23°	30 "
Maine.....	Eastport.....	3°	Eastport.....	-13°	1875	Fort Jessup.....	17°	23 "
Maryland.....	Baltimore.....	24°	Baltimore.....	15°	1880	Orono.....	-16°	12 "
Massachusetts.....	Springfield.....	13°	Boston.....	-2°	1875	Branswick.....	-3°	53 "
Michigan.....	Marquette.....	8°	Marquette and Escanaba.....	-9°	'75, '80	Emmitsburg.....	7°	13 "
Minnesota.....	St. Vincent.....	-18°	Duluth.....	-29°	1875	Florida.....	-14°	4 "
Mississippi.....	Vicksburg.....	25°	Vicksburg.....	23°	'77, '80	Fort Brady.....	-17°	59 "
Missouri.....	St. Louis.....	15°	St. Louis.....	8°	1880	Fort Ripley.....	-30°	17 "
Montana.....	Ft. Assiniboine and Ft. Shaw.....	-18°	Ft. Benton.....	-31°	1875	Columbus.....	22°	10 "
Nebraska.....	North Platte.....	-5°	North Platte.....	-10°	1877	North Springfield.....	9°	1 "
Nevada.....	Winnemucca.....	5°	Winnemucca.....	-9°	1880	Allenton.....	5°	4 "
New Hampshire.....	Mount Washington.....	-15°, 5	Mount Washington.....	-40°	1877	Jefferson Barracks.....	2°	35 "
New Jersey.....	Atlantic City.....	22°	Atlantic City.....	10°	1875	Camp Baker.....	-45°	9 "
New Mexico.....	Silver City.....	13°	Santa Fe.....	-11°	1880	Camp Sheridan.....	-17°	6 "
New York.....	Oswego.....	13°	Albany.....	-10°	1875	Camp Halleck.....	-12°	11 "
North Carolina.....	Charlotte.....	30°	Charlotte.....	18°	1880	Grafton.....	-16°	2 "
Ohio.....	Cleveland.....	16°	Columbus.....	-5°	1880	Dartmouth College.....	-9°	18 "
Oregon.....	Umatilla.....	20°	Umatilla.....	9°	1880	North Germantown.....	6°	2 "
Pennsylvania.....	Erie.....	17°	Pittsburg.....	4°	1880	Newark.....	8°	38 "
Rhode Island.....	Newport.....	20°	Newport.....	4°	1875	Fort Union.....	-15°	31 "
South Carolina.....	Charleston.....	28°	Charleston.....	3°	'77-79, '80	Canton.....	-20°	2 "
Tennessee.....	Knoxville.....	16°	Nashville.....	15°	1880	Gouverneur.....	17°	40 "
Texas.....	Mason.....	19°	Fort Elliott.....	-5°	1880	Fort Johnson.....	9°	54 "
Utah.....	Salt Lake City.....	13°	Salt Lake City.....	3°	1880	Westerville.....	-13°	9 "
Vermont.....	Burlington.....	3°	Burlington.....	-10°	1875	College Hill.....	2°	65 "
Virginia.....	Lynchburg.....	24°	Lynchburg.....	13°	1880	Camp Harney.....	4°	12 "
Washington T'y.....	Spokane.....	3°	Dayton.....	8°	1880	Fort Dalles.....	4°	16 "
West Virginia.....	Morgantown.....	26°	Morgantown.....	8°	1880	Franklin.....	8°	8 "
Wisconsin.....	La Crosse.....	5°	Milwaukee.....	-14°	1875	Philadelphia.....	12°	113 "
Wyoming.....	Cheyenne.....	9°	Cheyenne.....	-20°	1875	Allegheny Arsenal.....	4°	31 "

Frosts.—In the various districts they were reported on the following dates: New England, 2nd, 4th, 5th, 7th, 10th, 11th, 12th, 14th to 17th, 20th to 30th; Middle Atlantic states, 1st to 7th, 9th, 30th; South Atlantic states, 2nd, 4th, 5th, 13th, 14th, 16th, 17th, 20th, 21st, 24th to 29th; East Gulf states, 4th, 20th, 24th to 27th; West Gulf states, 3rd, 4th, 6th, 9th, 12th to 15th, 20th, 21st, 24th to 28th; Rio Grande valley, 25th; Ohio valley and Tennessee, 2nd to 6th, 9th, 10th, 12th to 17th, 19th to 30th; Lower Lake region, 1st, 2nd, 5th, 6th, 7th, 10th, 11th, 12th, 14th to 17th, 19th to 29th; Upper Lake region, 2nd to 7th, 9th to 30th; extreme Northwest, 1st to 5th, 8th to 30th; Upper Mississippi valley, 1st, 3rd to 30th; Missouri valley, 1st to 6th, 8th, 9th, 10th, 12th to 15th, 19th to 28th; Northern slope, 1st to 30th; Middle slope, 2nd to 5th, 7th to 28th, 30th; Southern slope, 3rd, 9th, 12th, 13th, 14th, 19th to 28th; Southern plateau, 1st to 30th; Middle Plateau, 1st to 4th, 7th, to 10th, 14th, 17th to 29th; Northern plateau, 1st to 30th; North Pacific coast region, 1st, 7th, 8th, 17th to 30th; Middle Pacific coast region, 7th, 8th, 11th, 12th,

15th to 26th; South Pacific coast region, 2nd to 28th, 30th. Stations in the Southern states report the occurrence of damaging frosts as follows: *North Carolina*: Wilmington, 25th, first killing frost of season, weather intensely cold, thermometer falling to 26°. Highlands, 3rd, first killing frost of season. Charlotte, 4th, first killing frost of season. *South Carolina*: Sumter, 25th, very heavy and damaging. Darlington, 25th, very heavy. Charleston, 25th, very heavy and damaging; all delicate plants left in the open air appeared as if scalded; 26th, killing frost. *Georgia*: Augusta, 24th, vegetation completely destroyed, ground froze hard and thick ice formed in places. Quitman, 25th, ice formed; vines killed. *Florida*: Pensacola, 4th, first frost of season. Mayport, 25th, first light frost of season. *Alabama*: Montgomery, 26th, first killing frost of season. Mobile, 25th, killing frost. *Mississippi*: Natchez, 4th, very heavy and destructive. *Louisiana*: New Orleans, 25th, first killing frost of the season; this damaging frost extended over nearly the whole of the state. *Texas*: Paris, 3rd, very heavy frost, seriously damaging the cotton crop; first killing frost of the season. El Paso, 10th, first killing frost of the season. Concho, 25th, killing vegetation. Uvalde, 25th, killing vegetation. Brackettville, 25th, killing vegetation. *Indian Territory*: Ft. Gibson, 20th, killing vegetation.

Ice.—Regarding its formation in the northern sections, this subject is considered elsewhere in the REVIEW under the head of *Ice in Rivers and Harbors*. The following are exceptional cases of ice formation in the southern portions of the country. *Arkansas*: Little Rock, 3d, 24th, 26th. *Louisiana*: New Orleans, 25th, thin ice formed on quiet water. Reports from the sugar districts say that the eyes of the cane have been killed by the hard freeze. *Maryland*: Fallston, 25th, $\frac{1}{2}$ inch thick. *Mississippi*: Fayette, 24th, $\frac{1}{2}$ inch; 25th, $\frac{1}{2}$ inch. Vicksburg, 24th, first of season. *Alabama*: Montgomery, 24th, first of season; 25th. Mobile, 25th, thick ice in exposed places; 26th. *South Carolina*: Sumter, 25th, first cold day of the season, ice $\frac{1}{2}$ inch thick in the streets. Darlington, 25th, "plenty of ice." Charleston, 25th, large quantities of ice formed in all parts of the city and remained unmelted until 10 a. m. Stateburg, 4th; 25th, $\frac{1}{2}$ inch thick. *North Carolina*: Wilmington, 25th, ice in exposed places $\frac{1}{2}$ inch thick. Lenoir, 16th, 17th. Weldon, 16th, first of season. *Tennessee*: Ashwood, 16th. Austin, 20th. *Texas*: Austin, 25th. Clarksville, 20th; 24th, $\frac{1}{4}$ to $\frac{1}{2}$ inch thick. McKavett, 24th, $\frac{1}{4}$ inch; 25th. Fort Griffin, 19th. Brackettville, 25th, $\frac{1}{4}$ inch, first of season. Denison, 24th. Cuero and Victoria, 24th; 25th, in exposed places. *Virginia*: Johnstown, 16th. *Indian Territory*: Fort Sill, 19th, $\frac{1}{2}$ inch, first of season. Fort Gibson, 20th, 1 inch.

PRECIPITATION.

The general distribution of rain-fall for the month of November, 1881, is shown on chart No. III from the reports of over 500 stations. From the table in the left-hand corner of the chart is obtained a monthly average for each of the various districts, determined from the records of Signal Service stations, added to which is a comparison of the present month with such averages for several years. A comparative examination of the rain-fall chart reveals the existence of a large area of excess embraced by the parallels of 30° and 48° N., and the meridians of 77° and 100° W. Within this extensive region the departures of excess range in the extremes from 0.35 inch in the South Atlantic states to 2.56 inches in the Lower Missouri valley. Excepting the South Atlantic states there is a continuous area of deficiency along the Atlantic coast from Florida peninsula northeastward to the Canadian Maritime provinces. On the Pacific coast there is an unbroken area of deficiency from Lower California northward to British Columbia, the departures ranging from 0.52 inch in the Middle Pacific coast region to 1.54 inches in North Pacific coast region. As a means of interesting comparison, the following maximum departures from the average are given for each year since 1872, together with the corresponding districts: 1873, large deficiency, Lower Missouri valley; 1874, +2.83 inches, North Pacific coast region and -2.00 inches Western Gulf states; 1875, +5.40 inches, Middle and North Pacific coast regions and +2.05 inches, Ohio valley and Tennessee; 1876, -2.00 inches, Ohio valley and Tennessee; 1877, +2.88 inches, Middle Atlantic states and +2.23 inches, Upper Lake region; 1878, +2.64 inches, St. Lawrence valley and -2.00 inches, Middle and North Pacific coast regions; 1879, +3.32 inches Lower Missouri valley and +2.65 inches Upper Mississippi valley; 1880, -5.33 inches, North Pacific coast region and +3.38 inches, Western Gulf states.

Deviations from Average Precipitation.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative monthly rain-falls in the lower left hand corner of chart No. III. The following items of importance in connection with this subject are reported by voluntary observers: *Illinois*: Riley, monthly rain-fall 0.46 inch above the average for the past 20 years; autumn of the present year, wettest ever recorded, the total precipitation being 6.96 inches more than the average of this season for the past 20 years, and 2.83 inches more than the maximum for that period which occurred in 1868. *Kansas*: Lawrence, monthly rain-fall 0.49 inch above the average for the past 13 years. Yates Centre, monthly rain-fall 0.60 inch above that of 1880. Wellington, monthly rain-fall 1.11 inches above the average of the past two years. *Maine*: Gardiner, monthly rain-fall 1.19 inches below

the average of the past 45 years. *Maryland*: Fallston, monthly rain-fall 0.75 inch below the average for the past 10 years. *Massachusetts*: Worcester, monthly rain-fall 0.10 inch above that for 1880. *Missouri*: St. Louis, Missouri Weather Service reports monthly rain-fall 6.32 or 3.37 inches above the average of past 45 years; this rain-fall has been exceeded but three times since 1839, viz: in 1847, 1869 and 1876, when the November rain-falls were 8.63, 7.48, and 11.55 inches respectively. *New Hampshire*: Contoocookville, rain-fall slightly below the average of past 10 years. *New Jersey*: monthly rain-fall 3.07 inches or 0.70 below the average for past 38 years; this monthly rain-fall has been exceeded in 22 of the preceding 38 years; autumn rain-fall 4.26 inches below the average of this season for the past 38 years; the largest rain-fall, 17.60 occurred in the autumn of 1847; smallest rain-fall 6.01 occurred in the autumn of 1879. The quantity of rain for the autumn of 1881, has been exceeded in every year, at this season, but one (1879) during the past 38 years. *New York*: North Volney, monthly rain-fall, 1.23 inches below the average of the past 9 years; rain-fall for autumn, 2.68 inches below the average for this season for the past 9 years; the autumn of 1881 has been the driest on record. Palermo, monthly rain-fall 2.50 inches below the average of the past 22 years; largest monthly rain-fall, 8.30 inches occurred in 1863; smallest monthly rain-fall, 1.40 inches occurred in 1867. Waterburg, monthly rain-fall 0.23 inch above the average for the past 10 years. *Virginia*: Wytheville, the following report is made by Mr. Howard Shriver, voluntary observer: "rain-fall for November differed little from the average, consequently the amount of rain due for the year, thus far, remains, as at the end of October, deficient."

Special Heavy Rains.—1st, Emmittsburg, Md., 2.94 inches; Pike's Peak, 2.91. 6th, New Orleans, 2.99; Mobile, 4.50 in 10 hours; Pensacola, 3.54; Ft. Barrancas, Fla., 6.07 in 12 hours. 6th and 7th, Green Springs, Ala., 3.07. 7th, Highlands, N. C., 2.50. 7th and 8th, Emmittsburg, Md., 3.80; Elworth, N. C., 3.00. 8th, Mt. Washington, 2.81; Shreveport, 2.50. 9th, Highlands, N. C., 3.10. 11th, Niles, Mich., 2.67; Chicago, 3.18; Vicksburg, 3.52; Pt. Pleasant, La., 4.02. 11th and 12th, Coldwater, Mich., 3.10. 14th, Ft. Gaston, Cal., 2.38. 18th, Springfield, Ill., 2.70; Indianapolis, 4.30; Columbus, 2.81; Champaign, Ill., 2.72; Boonville, Mo., 3.10; Hermann, Mo., 2.70. 19th, College Hill, Ohio, 2.50; Thatcher's Island, Mass., 3.19. 23d, Cape Henry, Va., 2.81.

Largest Monthly Rainfalls.—Mt. Washington, 15.10 inches; Thatcher's Island, Mass., 11.28; Emmittsburg, Md., 11.00; Highlands, N. C., 9.69; Indianapolis, 9.35; Cape Henry, Va., 8.96; Point Pleasant, La., 8.60; Ellsworth, N. C., 8.50; Chamois, Mo., 8.34; Ashwood, Tenn., 8.10; Ft. Barrancas, Fla., 8.09; Ft. Stevens, Or., 7.88; Champaign, Ill., 7.78; Coldwater, Mich., and New Corydon, Ind., 7.42; Mobile, 7.36; Ft. Canby, Wash. T'y., 7.29; Pensacola, Fla., 7.27; New Orleans, La., 7.24; Auburn, N. H., 6.95; Springfield, Ill., 6.93; Portland, Or., 6.91; Niles, Mich., 6.81; Olympia, 6.75; St. Louis, 6.74; St. Charles, Mo., and Mascoutah, Ill., 6.60; Little Rock, 6.50; New Shoreham, R. I., 6.47; Northport, Mich., 6.30; Evansville, Ind., 6.25; O'Fallon, Mo., Anna, Ill., Fayette, Miss., and Lenoir, N. C., 6.10; Vicksburg, 6.07; Jacksonburg, O., 6.05; and Norfolk, 6.04.

Smallest Monthly Rainfalls.—Browns and Tecoma, Nev., Terrace and Kelton, Utah, Maricopa, Wilcox, Yuma and Tucson, Ariz., and Indio, Cal., none; Stockton, Tex., and Ft. Washakie, Wyo., 0.07 inch; Williams and Spadra, Cal., 0.08; Pioche, Wadsworth and Toano, Nev., and Willows, Cal., 0.10; Golconda, Nev., and Campo, Cal., 0.11; San Diego and Newhall, Cal., and Rapid City, Dak., 0.12; Smithville, Dak., 0.14; Ft. Meade, Dak., 0.15; San Fernando, Cal., 0.16; Humboldt, Nev., 0.18; Ft. Wingate, N. M., 0.19; Promontory, Utah, 0.20; Ft. Verde, Ariz., 0.21; Carlin, Nev., and Princeton, Cal., 0.22; Los Angeles, Cal., 0.27; Sumner, Cal., and Terry's Landing, Mont., 0.28; Cheyenne, 0.29; Halleck, Nev., Prescott, Ariz., and Tulare, Cal., 0.30; Borden, Cal., and Ft. Sully, Dak., 0.31; Winnemucca, Nev., and Camp Thomas, Ariz., 0.32; Anaheim, Cal., and Florence, Ariz., 0.34; Bismarek, Dak., 0.35; Phoenix, Ariz., 0.36; North Platte, 0.37; Colton, Cal., 0.38; Ft. Buford, Dak., 0.39; Santa Barbara, Cal., 0.40; Wickenburg, Ariz., 0.41; Delano, Cal., and Ft. Elliott, Tex., 0.42; Ft. Bridger, Wyo., and Ft. Keogh, Mont., 0.44; Huron, Dak., 0.45; Merced and Goshen, Cal., 0.47; Mason, Tex., and St. Vincent, Minn., 0.48; Lordsburg, N. M., 0.49; Otega, Nev., Morriston and Ft. Totten, Dak., El Paso and Concho, Tex., and Geneseo, Ill., 0.50.

Rainy Days.—The number varied in New England from 12 to 26; Middle Atlantic states, 10 to 19; South Atlantic states, 8 to 15; Florida Peninsula, 8 to 19; East Gulf states, 11 to 14; West Gulf states, 6 to 16; Ohio valley and Tennessee, 11 to 16; Lower Lake region, 14 to 24; Upper Lake region, 15 to 24; extreme Northwest, 10 to 17; Upper Mississippi valley, 10 to 18; Missouri valley, 6 to 12; Northern slope, 7 to 15; Middle slope, 5 to 15; Southern slope, 1 to 7; Northern plateau, 7 to 15; Middle plateau, 3 to 11; Southern plateau, 0 to 5; North Pacific coast region, 12 to 18; Middle Pacific coast region, 4 to 6; South Pacific coast region, 0 to 3.

Cloudy Days.—The number varied in New England from 8 to 15; Middle Atlantic states, 7 to 17; South Atlantic states, 5 to 13; Florida Peninsula, 5 to 8; East Gulf states, 9 to 10; Western Gulf states, 6 to 11; Rio Grande valley, 6 to 14; Ohio valley and Tennessee, 6 to 12; Lower Lake region, 13 to 20; Upper Lake region, 10 to 22; extreme Northwest, 6 to 12; Upper Mis-

Mississippi valley, 6 to 15; Missouri valley, 6 to 11; Northern slope, 4 to 11; Middle slope, 2 to 5; Southern slope, 2 to 8; Southern plateau, 0 to 3; Middle plateau, 2 to 8; Northern plateau, 5 to 16; North Pacific coast region, 13 to 22; Middle Pacific coast region, 2 to 3; South Pacific coast region, 0 to 2.

Largest Monthly Snow-falls.—Mt. Washington, about 62.00 inches; Pike's Peak, 47.60; Cisco, Cal., 36.00; Summit, Cal., 30.50; Truckee, Nev., 27.00; Moorehead, Minn., 14.10; Salt Lake City, 14.00; Boca, Nev., 12.00; Helena, Mont., 11.90; Yankton, 8.60; Deadwood, 8.40; Ft. Stevenson, Dak., 8.20; Alta, Cal., 8.00; Ft. Missoula, Mont., 7.90; Corrinne, Utah, 7.00; Ft. Bennett and Ft. Shaw, Dak., 6.90; Ft. Assinnaboine, Mont., 5.30; Otega, Nev., 5.00.

Snow.—The dates on which snow fell in the various districts are as follows: New England, 4th to 8th, 10th to 13th, 15th, 16th, 19th to 28th; Middle Atlantic states, 3d, 4th, 12th, 15th, 20th, 23d, 24th, 25th, 27th; Ohio valley and Tennessee, 3d, 4th, 6th, 10th, 14th, 16th, 19th, 20th, 21st, 23rd, 24th, 26th; Lower Lake region, 3d, 4th, 5th, 11th, 12th, 14th, 15th, 18th to 22d, 24th to 28th; Upper Lake region, 1st to 5th, 8th to 27th, 29th, 30th; extreme Northwest, 1st, 2d, 4th, 5th, 7th, 8th, 10th to 18th, 20th, 21st, 22nd, 24th, 25th, 26th, 28th, 30th; Upper Mississippi valley, 2d to 5th, 10th to 15th, 17th to 21st, 23d, 25th, 30th; Missouri valley, 2d, 3d, 8th, 10th to 14th, 16th to 18th, 20th, 23d, 25th, 26th, 29th, 30th; Northern slope, 1st, 2d, 4th to 19th, 21st to 23d, 25th, 28th, 29th, 30th; Middle slope, 1st, 2nd, 3rd, 7th to 14th, 17th to 19th, 23d, 29th, 30th; Southern slope, Coleman City, 19th, and Ft. Elliott, 11th, 17th; Southern plateau, 1st, 6th, 8th, to 11th, 17th, 19th, 20th; Middle plateau, 1st, 2nd, 6th to 13th, 15th to 18th, 28th, 29th; Northern plateau, 7th to 9th, 11th, 13th, 14th, 16th, 17th, 20th, 22nd, 23rd, 25th, 26th, 28th, 30th; North Pacific coast region, Albany, Or., 13th, 14th, and Roseburg, 17th. Cases of particularly heavy snow were reported as follows: Pueblo, Colo., 11th, reports from western Kansas, eastern Colorado and northern New Mexico, show exceedingly heavy snow for past 36 hours; eastward to Crown lake from 6 to 8 inches fell, while from Lojunk westward, 18 to 25 inches were reported; all cuts full and heavy drifts forming rapidly. This was the heaviest snow storm in New Mexico and Colorado, that the Santa Fe railroad has ever encountered. Lincoln, Neb., 10th, violent storm, snow falling at the rate of one inch per hour. Cheboygan, Mich., 4th, six inches fell during the night. Cabot, Vt., 4th, snow fell to the depth of 14 inches. Winnipeg, Manitoba, 17th very heavy snow storms during the past few days; all railway work suspended, trains blockaded, grading contracts closed for the season. Sherman, Wy. 11th blinding snow storm and heavy drifts; overland trains abandoned. Milford, Pa., 23d, very heavy snow throughout Pike county. Jamestown, N. Y., 4th, furious storm all day; twelve inches deep in northern part of county. Portsmouth, N. H., 4th, very heavy storm throughout western portion of State. Friendship, N. Y., 4th, snow fell to a depth of 8 inches. Elsworth, N. C., 16th, mountains covered with snow. 24th, mountains covered with snow, which is blown off in such quantities as to make it appear like a snow storm, although the weather is clear. Dyberry, Pa., 25th, 26th, snow sufficient for sleighing.

Snow from a Cloudless Sky.—Dubuque, 23d from 8.40 to 8.55 p. m. Rochester, 28th, 6.58 a. m., no clouds were visible within 45° of zenith. New Haven, 20th. Lansing, Mich., 13th, 9 p. m., rain and snow fell from a cloudless sky, lasting fifteen minutes. Bismarck, Dak. 18th.

Depth of Snow on Ground at End of Month.—St. Vincent, Minn., 10 inches; Pike's Peak, 6; Denver, 5; Umatilla, Or. and Mt. Washington, 4; Helena, Mont., and Dayton, Wash. Ty., 2½; Embarrass, Wis., 2; Escanaba, 1½; Franklin, Wis. and Moorehead, Minn., 1; Mendon, Mass., ¾; Neillsville, Wis. and Alpena, Mich., ¾; Ft. Benton, Mont., Springfield, Mass. and Des Moines, ¾; Salt Lake City, 1 to 5; Dyberry, Pa., 2 to 3; Marquette, Mich., La Crosse and Madison, Wis., Albany and North Volney, N. Y. and Morrison, Ill., trace.

Sleet.—Sedalia, Mo., 17th, heaviest storm of the kind ever before experienced in this section; shade trees, fences and buildings heavily coated with ice, the first mentioned being greatly damaged; loss to city estimated at \$5000. Springfield, Ill., 17th, trees, telegraph wires and fences covered with a heavy coating of ice; telegraphic communication seriously interrupted. Carrollton, Ill., 17th, trees covered with ice and in many cases badly broken; telegraphic communication seriously interrupted. Boonville, Mo., 17th, unusually heavy storm of sleet causing great damage to orchards and shade trees. Clinton, Ill., 17th, one of the heaviest storms of sleet ever known in this section; great damage to orchards. Independence, Mo., 18th, very heavy and disastrous, followed by snow. Griggsville, Ill., 18th, worst storm of sleet in the past 25 years; the damage to fruit and shade trees was considerable; many trees, six inches in diameter, were snapped off by the weight of the ice. Highlands, N. C., 24th, during morning a frozen mist like sleet covered the forest. Port Huron, 23d, 11.15 a. m., during storm great sheets of sleet swept over the city; continued until 2.10 p. m., when it turned to rain. Northport, Mich., 25th, 3 a. m. accompanied by an exceedingly violent gale causing a great many wrecks on the north shore of Lake Michigan.

Hail.—Near Dry Pond, Jackson county, Ga., 8th, causing great damage to crops, destroying cotton and beating the bark off trees and stumps; five days after the storm hailstones were found

in some places 16 inches deep, many stones being as large as partridge eggs. Fall River, Mass., 15th, greatest fall of hail that has been experienced here for years.

RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England, from 71 to 86; Middle Atlantic states, 66 to 78; South Atlantic states, 71 to 81; Florida peninsula, 74 to 79; East Gulf states, 72 to 78; West Gulf states, 69 to 81; Rio Grande valley, 67 to 83; Ohio valley and Tennessee, 67 to 77; Lower Lake region, 65 to 76; Upper Lake region, 75 to 83; extreme Northwest 69 to 87; Northern slope, 58 to 73; Middle slope, 49 to 76; Southern slope, 52 to 70; Southern plateau, 42 to 61; Middle plateau, 40 to 65; Northern plateau, 69 to 85; North Pacific coast region, 82 to 86; Middle Pacific coast region, 56 to 64; South Pacific coast region, 39 to 61. *High stations* report the following percentages not corrected for altitude: Pike's Peak, 76.2; Denver, 60.2; Cheyenne, 58.2; Mt. Washington, 86.0.

WINDS.

The prevailing winds during the month of November, 1881, at Signal Service stations, are shown on chart No. II, by arrows, which fly with the wind. In the South Atlantic and East Gulf states, *northeasterly*; in the Middle Atlantic states and New England, *northwesterly*; in the Lake region, Tennessee and Ohio valley, *southerly*; in the Upper Mississippi and Missouri valleys, *northwesterly*; in the Western Gulf states, including Texas, *southerly* and *northerly*; in the Rocky Mountain and Plateau regions, *variable*; in the North Pacific coast region, *southerly*; in the Middle and South Pacific coast regions, *north to west*.

Total Movements of the Air.—The following are the largest total movements at Signal Service stations: Mt. Washington, 31,375 miles; Pike's Peak, 17,519; Del. Breakwater, 12,861; Cape May, 12,675; New Shoreham, R. I., 12,501; Wood's Holl, Mass., 12,370; Thatcher's Island, Mass., 11,337; Sandusky, 11,250; Sandy Hook, 11,143; Grand Haven, 11,044; Indianola, 10,886; Erie, 10,538; Kitty Hawk, 10,529; Rochester, 10,338; Port Eads, La., 10,320; Milwaukee, 10,128; Buffalo, 10,114; Madison, Wis., 9,884; Champaign, Ill., 9,808; Cape Henry, Va., 9,712; Hatteras, N. C., 9,611; Portsmouth, N. C., 9,398; Barnegat, N. J., 9,379; Cleveland, 9,283; Alpena, Mich., 9,179; Galveston, 9,178; Port Huron, 9,011; North Platte, 8,927; Key West, 8,828; Moorehead, Minn., 8,810; St. Vincent, Minn., 8,722; St. Louis, 8,618; Omaha, 8,581; Huron, Dak., 8,499; Dodge City, 8,402; Ft. Stevenson, Dak., 8,378; Cheyenne, 8,350; Burlington, Vt., 8,346; Marquette, 8,329; Ft. Sill, Ind. T., 8,323; Detroit, 8,315; Oswego, 8,121; Newport, R. I., 8,099; Toledo, 8,090. The *smallest* are Missoula, Mont., 935; La Mesilla, N. M., 1,082; Lynchburg, 1,378; Phoenix, Ariz., 1,511; Silver City, N. M., 1,526; Visalia, Cal., 1,887; Salt Lake City, 2,205; Uvalde, Tex., 2,325; Augusta, Ga., 2,382; Lewiston, Idaho, 2,390; Spokane, Wash. T., 2,624; Laredo, Tex., 2,645; Red Bluff, 2,858; Boise City, 2,864; Florence, Ariz., 2,934.

High Winds.—On summit of Mt. Washington the following high velocities were reported: 108 miles, NW., 10th; 100 miles, NW., 20th; 98 miles, NW., 9th, 18th; velocities exceeding 50 miles per hour were reported from 2nd to 22d and from 24th to 30th. On summit of Pike's Peak, a maximum velocity of 68 miles was reported as follows: from NE., 11th; SW., 12th, 16th; velocities exceeding 50 miles per hour were reported from 4th to 6th, 11th, 12th, 14th to 16th, 18th, 19th, 24th. Other stations reporting velocities of 50 miles per hour or over are as follows: Ft. Custer, Mont., 53 miles, NW., 12th; North Platte, 50, NW., 4th; Ft. Buford, 50, W., 13th; Bismarck, 50, W., 13th, Indianola, 55, N., 2d; Sandusky, 56, W., 14th; Thatcher's Island, Mass., 56, NW., 11th; Wood's Holl, Mass., 50, NW., 20th; Cape May, maximum velocity, 66, NW., 20th, 52, SW., 4th, 15th, and 55, NW., 24th; Delaware Breakwater, 54, NW., 24th; Cape Henry, Va., 52, NW., 3d, 4th; Kittyhawk, 52, N., 4th.

Local Storms.—Near Fort Ridgely, Minn., 25th, very violent tornado moved from southwest to northeast causing great destruction of property. A large black, funnel-shaped cloud approached rapidly from the west and when near by, the centre of the cloud appeared to change its color to a dirty green and purple; lightning flashed and heavy thunder rolled. While the dark cloud was passing the wind whirled with indescribable rapidity; one man was thrown against a tree and his side smashed; another was carried high in the air and thrown lifeless on the ground, his clothing being entirely stripped from his body. Wild ducks, prairie chickens and domestic fowls were killed in considerable numbers and entirely stripped of feathers; in some instances harness was completely torn from the backs of horses and the animals killed or badly wounded. All houses was in the track of the storm were entirely demolished. Fayette, Miss., 11th, at a point four miles east of station a violent tornado suddenly made its appearance in a gentleman's yard. Every tree was blown down and many were scattered in all directions. In the house, crockery, etc., was broken, but the building, a strong frame, was not injured, the doors and windows being open. An eye witness states that the air was filled with flying timber. The tornado passed off very quickly, and lifted from the ground, doing no other damage for a considerable distance until it again descended

to the earth, when it entirely demolished a dwelling and a cotton house, scattering and carrying their contents great distances. Various articles of clothing were seen whirling through the air. Its track was narrow and about eight miles in length.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for November, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 86.02 per cent. The percentages for the four elements are: Weather, 88.25; Direction of the Wind, 81.96; Temperature, 87.71; Barometer, 86.03 per cent. By geographical districts they are: For New England, 87.3; Middle Atlantic states, 88.4; South Atlantic states, 89.8; Eastern Gulf states, 85.4; Western Gulf states, 86.2; Lower Lake region, 85.3; Upper Lake region, 84.6; Tennessee and the Ohio valley, 86.8; Upper Mississippi valley, 86.4; Lower Missouri valley, 80.6; Northern Pacific coast region, 65.9; Central Pacific coast region, 86.6; Southern Pacific coast region, 93.5. There were 78 omissions to predict out of 3,690, or 2.00 per cent. Of the 3,612 predictions that have been made, 130, or 3.60 per cent., are considered to have entirely failed; 117, or 3.24 per cent., were one-fourth verified; 367, or 10.16 per cent., were one-half verified; 414, or 11.46 per cent., were three-fourths verified; 2,584, or 71.54 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary Signals.—221 Cautionary signals were displayed during the month of November, 1881, of which 199, or 90.09 per cent., were fully justified by winds of twenty-five miles per hour, or over, at, or within, a radius of 100 miles of the station. Sixty-seven Off-shore signals were displayed, of which 51, or 76.12 per cent., were fully justified; 53 or 79.10 per cent., were justified as to direction; 61, or 91.05 per cent., were justified as to velocity, and 4, or 5.97 per cent., completely failed. Twenty-one Off-shore signals were changed from Cautionary. Two Northwest signals were displayed, both of which were fully justified. 290 signals, of all kinds, were displayed, of which 252, or 86.89 per cent., were fully justified. The above does not include signals ordered at 67 display stations, where the velocity is only estimated. 149 winds, of 25 miles, or over, were reported, for which no signals were ordered. 49 signals were ordered late.

NAVIGATION.

Stage of Water in Rivers.—In the table on the right-hand side of chart No. III are given the highest and lowest stages of water as observed at Signal Service stations during the month of November, 1881. The water in the Missouri river has remained at a very low stage throughout the month being at all stations, even on the date of highest water, from 10 to 18 feet below the danger-line. In the Mississippi, there has been a moderately high stage from St. Paul to Dubuque; at Davenport and Keokuk the water has been from 1 to 5 feet above the danger-line; at St. Louis within 6 inches of the danger-line, and from Cairo to New Orleans all stations remained from 4 to 8 feet below the danger-line. In the Ohio, Cumberland, Tennessee and Monongahela rivers the water remained quite low throughout the month, the highest being at Pittsburg where it reached within 8 feet of the danger-line. In the Red, Arkansas, Savannah and Sacramento rivers, no changes of importance took place; water quite low throughout the month.

Ice in Rivers and Harbors.—*Saginaw River:* East Saginaw, 25th, ice forming rapidly and people reported crossing on the ice at Zilwaukee. Bay City, 24th, ice formed during the night and on the following day river full of broken cakes of ice. *Dakota River:* Morriston, Dak., 14th, river frozen over. *Embarrass River:* Embarrass, Wis., 28th, river frozen over. *Manitowoc River:* Manitowoc, Wis., 20th, river frozen over. *Lake Huron:* Port Huron, 25th, schooner "A. J. Rogers," just in port from Thunder Bay, is badly iced up. Schooner "Emerald," from Presque Isle, 25th, vessel covered with a perfect coat of ice, everything on decks frozen solid. *Mississippi River:* Red Wing, Minn., 18th, large quantities of floating ice between St. Paul and Lake Pepin; steamer "Imperial" was from 4 p. m. of the 18th, until noon of the 22d, in making a distance of 60 miles. La Crosse, 15th, floating ice in river, first of season; 28th, ice broke up in river. Davenport, 10th, although no ice has yet appeared in the river, the weather has been so cold that navigation is now considered closed for the season. St. Paul, 15th, 17th, 24th, floating ice in river, 18th, river frozen along the banks. Steamer "Arkansas" left port; the last boat of season. 20th, river frozen along the banks; channel full of ice; navigation practically closed for the season. River has been open from April 7th to November 20th, a period of 227 days. The greatest depth of water (19 feet 8 inches) occurred April 29th; lowest (3 feet 4 inches) occurred September 14th and 15th, giving a range for the season of 11 feet 5 inches; average depth, 11 feet 5 inches. 22d, ice gorged in river below city. 23d, gorge broke during morning. *Milwaukee River:* Milwaukee, 20th, river frozen over. *Red River of the North:* Moorehead, Minn., 15th, river frozen over. St. Vincent, Minn., 13th, river frozen. Winnipeg, 18th, river frozen over, but not strong enough to permit crossing. *Tongue River:* Ft. Keogh, Mont., 18th, river frozen over. *Missouri River:* Bismarck, 18th, river frozen over and teams crossing. Yankton, 18th, river frozen over. Ft. Buford, 17th, river frozen over. Ft. Sully, Dak., 15th, ice floating in river.

Ft. Hale, Dak., 17th, river closed. Morriston, Dak., 14th, river closed. *St. Croix River*: St. Croix, 18th, river frozen over, navigation closed. *Assinaboine River*: Winnipeg, 17th, river frozen over sufficiently strong to bear up crossing teams. *Chippewa River*: Chippewa City, 17th, both steamboat and raft navigation suspended; river full of floating ice. *Stillwater Lake*: Stillwater, Minn., 17th, lake froze over during the night. *St. John's River*: St. John, New Brunswick, 23d, ice forming rapidly, navigation closed. *Maumee River*: Toledo, 25th, river frozen over. *Walkill River*: Montgomery, N. Y., 25th, river nearly frozen over. *Rock River*: Rockford, Ill., 24th, river frozen over; 29th, river clear of ice. *Erie Canal*: Rochester, 26th, light floating ice. Syracuse, 26th, ice thawing quite rapidly.

Floods.—*Illinois*: Springfield, 22d, Sangamon river overflowed; all bottom lands flooded; loss to the corn crop in this vicinity estimated at \$250,000. Riverton, 22d, terrible devastation by the flood; many fields of corn covered with water; water over wagon roads four feet deep in many places; cattle pens partially submerged. Alcohol Walk, 22d, 200 cattle and 1,300 hogs driven out of the cattle pens owing to high water; considerable loss to animal life; paper mill suspended operations and threatened with overflow; one farmer lost 2,000 bushels of corn and many others smaller quantities. Rushing River, 18th, exceedingly heavy rains; streams flooded and much damage caused to farm property. Carrollton, 17th, Apple and Macoupin creeks higher than ever before known; many bridges carried away and much other damage done. Decatur, 18th, a violent rain storm has prevailed for the past 36 hours without cessation; farmers report the whole country under water; several bridges and over 80,000 feet of lumber carried away. Marshall, 18th, heavy rains for past two days causing considerable damage to railroad beds and trestles; on the Cairo division of the Wabash R. R., all traffic delayed. Hillsboro, 18th, terrific storm of rain accompanied by the heaviest flood known for many years; bridges washed away and a great amount of farm property destroyed; all trains delayed by serious washouts. Clinton, 18th, very heavy floods; much damage to bridges and farm property. St. Francisville, 18th, railroad bridge washed away and all travel interrupted. Alton, 18th, Wood river overflowed; hundreds of acres on either side under water; all railroad bridges across the river have been swept away or made so dangerous that travel is completely checked. Charleston, 18th, creeks higher than they have been since 1875. 21st, Embarrass river higher than it has been at any time since 1875. *Indiana*: Indianapolis, 18th, reports from the middle and southern portions of the state show great damage by heavy floods, consequent upon the recent incessant rains. White river has risen 12 feet, and, at this date, is rising at the rate of one foot per hour; water within four feet of the great rise of 1874. Two creeks passing through the city overflowed, causing great damage to private property; on some streets the water was deep enough to swim a horse. All railroads seriously affected by the floods. Vincennes, 18th, heavy and incessant rains for the past three days: Wabash river overflowed. Lafayette, 18th, Wabash river and tributaries rising rapidly; bottom lands completely submerged. Dayton, 18th, Wild Cat creek overflowed, carrying away railroad bridge, and causing other serious damage. Muncie, 18th, heavy rains for past three days bridges carried away. Eaton, 18th, creeks overflowed, and railroad bridge washed away; all travel suspended. *Missouri*: St. Louis, East Side, 19th, low lands submerged, in some localities hundreds of acres completely under water, varying from 6 to 18 inches in depth; Cahokia creek overflowed, and between the Stock Yards and Venice bottom lands flooded; several serious washouts on the Indianapolis and St. Louis R. R. The rain fall accompanying this storm of the 17th and 18th was the heaviest in this portion of Missouri for the month of November during the past ten or fifteen years. The destruction to railroad and farm property has been enormous. The rapid rise in the waters of the Missouri for this month of the year, has never before been experienced in the history of Missouri floods. Railroad and telegraphic communication generally suspended. Washington, 18th, heavy rains and serious washouts on railroads; much damage to farm property. Gasconade, 18th, all trains delayed and much damage caused by the floods. Hermann, 18th, heavy washouts on the Missouri Pacific R. R.; all travel suspended. New Haven, 18th, two miles east of station railroad bridge carried away; road-bed for several miles badly washed. *Ohio*: Coshocton, 18th, extraordinary rains during the past 48 hours, causing an immense amount of damage in this section of the country. All streams in this vicinity have overflowed their banks. The Tuscarawas, Walhonding and Muskingum rivers have risen over ten feet in the past ten hours and still rising at the same rate. Hay, corn, wheat, straw and fences along the creek and river bottoms have been carried away by the heavy flood. *Texas*: Brackettville, 12th, most disastrous floods along the Rio Grande river that have occurred in the past 30 years; rain has fallen almost daily since the 13th of September. Brownsville, 11th, Rio Grande river higher than at any time since 1848. Matamoras, 11th, about three-fourths of the town under water, great damage to property and much suffering among the poorer classes. *Wisconsin*: Beloit, 4th, Rock river much swollen; 30 feet of dam gave way, causing suspension of work in mills.

Waterspouts.—Life Saving Station, No. 6, N. C., 5th, 9.30 a. m., a well defined waterspout was observed off Fresh Pond Hill, three miles south of station. Its trunk proceeded from the base of a dense cumulo-stratus cloud to the water's surface. It moved gradually with a swaying whirl-

ing motion towards a point slightly north of east and was accompanied by a sound similar to that produced by the wind in passing through a pine forest. Its mean height was about fifteen feet; color similar to that of the surrounding clouds, a dark leaden hue. No peculiar conditions of the surrounding atmosphere were apparent during its existence. Phenomenon lasted forty-five minutes.

High Tides.—Punta Rassa, Fla., 23d, very high; water over one foot deep under office building.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left-hand side of chart No. III. Owing to breakage of instrument, observations at Marquette were discontinued from the 14th to the 26th, inclusive. The report from Chincoteague failed to appear in time for publication.

ATMOSPHERIC ELECTRICITY.

Auroras.—The most important display that occurred during the month was that of the 23d which was reported by numerous intervening stations from Osewgo westward to Helena, Mont. and southward to Ft. Madison, Ia. At many of the stations reporting, the display was brilliant, beginning early in the evening and lasting until after midnight. The display of the 9th was observed at the following stations: Ft. Bennett, 4 a. m.; Huron, Dak., 5 a. m.; La Crosse, early morning; Clinton, Ia., 1.30 a. m.; Dubuque, 12.30 to 2.30 a. m.; Riley, Ill., 4.10 a. m.; Springfield, Ill., 5.30 a. m.; Milwaukee, early morning. The following stations report the display of the 17th: Clear Creek, Neb.; St. Vincent, Minn. and New Corydon, Ind. The display of the 26th was reported from Ft. Shaw, Mont., Deadwood, Dak., and Northfield, Minn. Other displays have been reported from the following stations: Ft. Shaw, Mont., 22d, from 8 to 11 p. m., Deadwood, Dak., 27th, 9 p. m.; St. Vincent, Minn., 20th, 7 p. m.; Moorehead, Minn., 10th, 5 to 5.30 a. m.; Embarrass, Wis., 19th, p. m.; New Corydon, Ind., 20th, 2 a. m.; Vevay, Ind., 12th, 8 a. m., 13th, p. m.; Port Huron, Mich., 22d, 8.40 to 9.15 p. m.; Oswego, 2d, 7.45 to 8.15 p. m., 16th, 11.30 p. m., to midnight; Newport, R. I., 16th, 11 p. m., to a. m., of 17th; Auburn, N. H., 10th; Dexter, Me., 14th; Gardiner, Me., 27th, 11.30 p. m., to 3.30 a. m., of 28th.

Thunder Storms.—They were reported in the various districts as follows: New England, 9th, 15; Middle Atlantic states, 8th, 9th; South Atlantic states, 9th, 30th; East Gulf states, 2d, 6th, 8th, 11th, 12th, 20th, 30th; West Gulf states, 1st, 7th, 8th to 11th, 18th, 21st, 30th; Ohio valley and Tennessee, 8th, 9th, 16th, 17th, 18th, 30th; Lower Lake region, 5th, 14th; Upper Lake region, 16th, 30th; extreme Northwest, Ft. Stevenson, 13th, 17th; Upper Mississippi valley, 7th, 8th, 10th, 11th, 18th, 30th; Missouri valley, 7th, 10th, 11th, 17th, 18th; Southern slope, 1st, 2d, 10th, 11th; Middle slope, 10th, 11th, 17th; Southern plateau, Camp Thomas, Ariz., 9th; North Pacific coast region, Roseburg, 17th; Middle Pacific coast region, Red Bluff, 15th.

Zodiacal Light.—Nashville, Tenn., 2d, 13th, 14th, 19th, 20th, 25th, 26th, 27th, 28th, 29th; Chattanooga, 14th; Cresco, Ia., 19th; Cambridge, Mass., 11th, 14th, 15th, 20th, 25th, 26th; Somerset, Mass., 22d, 24th, 25th; Clear Creek, Neb., 18th to 24th; Wytheville, Va., 13th; New Corydon, Ind., 2d, 4th, 21st, 22d, 23d, 25th, 27th to 30th.

OPTICAL PHENOMENA.

Lunar halos have been observed in the various districts on the following dates: New England 3d to 7th, 9th, 10th, 11th, 29th, 30th; Middle Atlantic states, 2d, 5th, 6th, 7th, 20th, 27th, 28th, 29th; South Atlantic states, 1st to 3d, 5th, 23d, 28th, 30th; East Gulf states, 1st to 5th, 9th, 28th; West Gulf states, 1st to 4th, 6th, 12th, 13th, 14th, 28th, 30th; Rio Grande valley, 2d, 3d, 13th; Ohio valley and Tennessee, 1st to 6th, 9th, 11th, 16th, 25th, 29th, 30th; Lower Lake region, 1st, 2d, 6th, 7th, 25th, 28th, 29th, 30th; Upper Lake region, 1st, 4th to 6th, 10th, 28th, 29th; extreme Northwest, 5th, 6th, 8th, 27th; Upper Mississippi valley, 1st, 4th, 5th, 6th, 9th, 10th, 18th, 27th, 28th, 29th; Missouri valley, 2d, 5th, 6th, 28th, 29th; Northern slope, 1st, 5th, 9th, 10th, 13th, 26th, 29th, 30th; Middle slope, 1st, 6th, 8th, 28th; Southern slope, 3d, 4th, 28th; Southern plateau, 2d, 3d, 5th, 6th, 27th; Middle plateau, 2d, 5th, 17th, 27th, 30th; Northern plateau, 8th, 14th, 26th, 29th, 30th; North Pacific coast region, 1st, 2d, 13th, 26th; Middle Pacific coast region, 5th, 26th, 29th; South Pacific coast region, 4th, 5th, 26th, 28th, 30th.

Solar halos have been observed in the various districts on the following dates: New England, 5th, 7th, 10th, 11th, 21st, 22d, 23d; Middle Atlantic states, 10th, 22d, 28th, 29th; East Gulf states, 10th, 14th, 29th; West Gulf states, Little Rock, 6th; Ohio valley and Tennessee, 6th, 8th to 11th, 17th, 22d to 25th, 29th; Lower Lake region, 6th, 9th, 10th, 11th, 23d, 25th; Upper Lake region, 13th, 20th, 21st, 26th; extreme Northwest, 15th to 18th, 23d; Upper Mississippi

valley, 5th, 10th, 19th, 23d, 29th; Missouri valley, Huron, Dak., 23d; Northern slope, North Platte, 1st, 24th; Middle slope, 6th, 24th, 26th, 29th; Southern slope, Fort Griffin, 19th; Northern plateau, Umatilla, 2d, 12th; North Pacific coast region, Albany, Or., 13; Middle Pacific coast region, 5th, 12th, 26th, 27th.

Mirage.—Northport, Mich., 13th; Indianola, 2d to 4th, 6th, 12th to 14th, 20th, 22d to 25th.

MISCELLANEOUS PHENOMENA.

Meteors.—Yuma, Ariz., 2d, 8 p. m., started from the constellation "Andromeda" at an altitude of 50° ; pursued a southeasterly course, and disappeared near the "Pleiades." It started slowly and gradually increased in speed, leaving behind a long train of whitish red color. Louisville, 16th, 7 p. m., very large; made its appearance in eastern sky, about 45° above horizon, and shot over toward the west. When about in the zenith, the head of the meteor seemed to expand, becoming much greater in size and brilliancy. It disappeared in the west, leaving a track behind that remained faintly luminous for fifteen minutes. Wytheville, Va., 2d, 9 p. m., a large meteor was observed at an altitude of 15° or 20° above the horizon in the southeastern sky. Its size was, apparently, equal to that of the full moon. It left a train of hazy white, which disappeared shortly after its flight. Eastport, 20th, very bright, first observed in northern sky; pursued an easterly course; duration of flight, about five seconds. Vevay, Ind., 16th, 7 p. m., very brilliant; illuminated the city and adjacent country. Its course was from zenith to a south-westerly point, where it bursted like a rocket. Meteors worthy of less note have been reported as follows: Umatilla, Oreg., 15th; Boise City, Idaho, 8th, 9th, 22d; Pioche, Nev., 27th, 28th; Yuma, Ariz., 25th; Davenport, 28th; La Crosse, 24th; Springfield, Ill., 14th; Detroit, 29th, numerous; Rio Vista, Cal., 4th, very brilliant; Southington, Conn., 13th, 14th, 15th; New Corydon, Ind., 2d; Vevay, 5th, 12th to 16th, 19th, 22d, 30th; Monticello, Iowa, 12th, 13th, 14th, 17th; Clinton, Iowa, 15th; Woodstock, Md., 13th, 15th; Springfield, Mass., 15th; Fall River, Mass., 20th; Fayette, Miss., 13th, 27th; Corning, Mo., 8th; Atco, N. J., 16th, 22d; Freehold, N. J., 6th, 14th, 22d; Moorestown, N. J., 13th; Vineland, N. J., 15th; Jacksonburg, O., 16th; Fallsington, Pa., 14th; Stateburg, S. C., 9th, 13th, 14th; Clarksville, Tex., 15th, 16th, 20th.

Earthquakes.—San Francisco, 11th, 4 p. m., slight shock; 13th, 11.20 p. m., slight shock of about twenty seconds duration. Carson City, Nev., 9th, 10 a. m., sharp shock of two seconds duration; motion from north to south. Berne, Switzerland, 18th, two heavy shocks during the night. Cologne, Prussia, 18th, violent shock of short duration occurred during the night, and slight tremors were felt for several hours after it. On the same night two shocks were felt at Bonn, Germany. These earthquakes originated at Zurich and passed in two waves through western Germany towards Holland. Agram, Austria, 15th, three shocks of earthquake were experienced during the night. Messina, Italy, 16th, two shocks, the first at 1 a. m. and the second at 5.40 a. m.; considerable loss of life and property in the interior. These shocks were felt at Naples, Catanazaro and Cozenza. Pesth, Hungary, 15th, three shocks were experienced during the night. Island of Chios, off the west coast of Asia Minor, near Cape Bianco, 11th, during past week very heavy shocks occurred and the village began sinking into the earth; town abandoned. Chilcoot, Alaska, Oct. 2d, 1.30 p. m. light shock; Oct. 6th, 11 a. m., light shock.

Migration of Birds.—*Geese flying south*: Ft. Adams, R. I., 11th; Somerset, Mass., 13th; Fayette, Miss., 10th; Clear Creek, Neb., 5th, 8th, 14th; Palermo, N. Y., 13th; Bellefontaine, O., 6th; Portsmouth, O., 4th; Visalia, Cal., 4th, 6th, 18th, 23rd; Red Bluff, Cal., 8th, 13th; Indianola, 11th, 13th, 23rd; Macon, N. C., 20th. *Flying north*: Red Bluff, 25th; Indianola, 3rd. *Ducks flying south*: Clear Creek, Neb., 14th, 16th; Dubuque, 13th; Indianola, 13th, 19th, 20th. *Blackbirds*: Memphis, 9th, 10th; flying south. *Rice birds*: Memphis, 9th, 10th; flying south.

Polar Bands.—Ft. Sill, Ind. Ty., 19th; Mobile, 14th; Augusta, Ga., 3rd; Gardiner, Me., 27th, Fayette, Miss., 18th, 30th; Clear Creek, Neb., 6th, 9th, 10th, 12th, 13th, 16th, 20th, 21st, 22d, 25th, 28th; Auburn, N. H., 17th; Wytheville, Va., 3rd, 5th, 6th, 17th, 26th, 29th; New Corydon, Ind., 21st.

Prairie Fires.—St. Vincent, Minn., 12th; Huron, Dak., 2d, 3d, 5th, 6th; Clear Creek, Neb., 6th, 17th; Genoa, Neb., 4th; Yankton, 1st, 4th to 6th, 8th, 16th, 22d, 23d, 25th, 28th; Ft. Gibson, Ind. T., 16th.

Sand Storms.—Winnemucca, Nev., 14th. San Carlos, Ariz., 19th, heaviest ever seen at this place; continued from 10 a. m., until midnight. Camp Thomas, Ariz., 1st, 7th, 17th, 19th, 24th.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 178 stations show 5,296 observations to have been made, of which 27 were reported doubtful; of the remainder, 5,269, or 84.3 per cent., were followed by the expected weather.

Sun Spots.—The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Mass:

DATE— Nov., 1881.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		REMARKS.
	Groups	Spots.	Groups	Spots.	Groups	Spots.	Groups	Spots.	
5, 10 a. m.....	1	2					1	2	
6, 12 m.....	2	2	0	0	1	1	3	3	
10, 8 a. m.....	3	18†					5	20†	
11, 10 a. m.....	0	0	0	0	0	0	5	20†	
15, 2 p. m.....	2	8					3	20†	
16, 3 p. m.....	0	15†					3	35†	
17, 10 a. m.....	0	0	0	0	0	0	3	35†	
20, 1 p. m.....	0	0	0	0	0	0	3	35†	
22, 10 a. m.....	1	5	0	0	0	0	4	35†	
24, 10 a. m.....	0	0	1	0	0	0	3	30†	
25, 12 m.....	0	0	0	0	0	0	3	22†	
28, 1 p. m.....	2	12					3	15†	

†Approximated.

Faculae were seen at the time of every observation.

Mr. Wm. Dawson, at Spiceland, Ind., reports as follows: 1st, 1 group, 1 small spot on west side. 6th, 5 groups, 10 spots. 9th, 4 groups, 12 spots. 12th, 4 groups, 14 spots. 13th, 7 groups, 33 spots, 1 large spot near east edge. 28th, 4 groups, 25 spots. Mr. David Trowbridge, at Waterburg, N. Y., reports: 6th, 1 group, 1 spot. 11th, 5 groups, 5 spots; 1 group appeared by rotation. 12th, 6 groups, 6 spots; 1 new group has arisen. 17th, 3 groups, 11 spots; 1 group of large spots. 22d, 2 groups, 11 spots. 28th, 1 group, 1 spot; the large group has disappeared by rotation. Mr. H. D. Govey, at North Lewisburg, Ohio, reports: sunspots were observed on every clear day during the month. They were most numerous on the 13th, 16th, 23d, and least numerous on the 1st, 27th.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

H. B. Wagon

Brig. & Bvt. Maj. Gen'l,
Chief Signal Officer, U. S. A.

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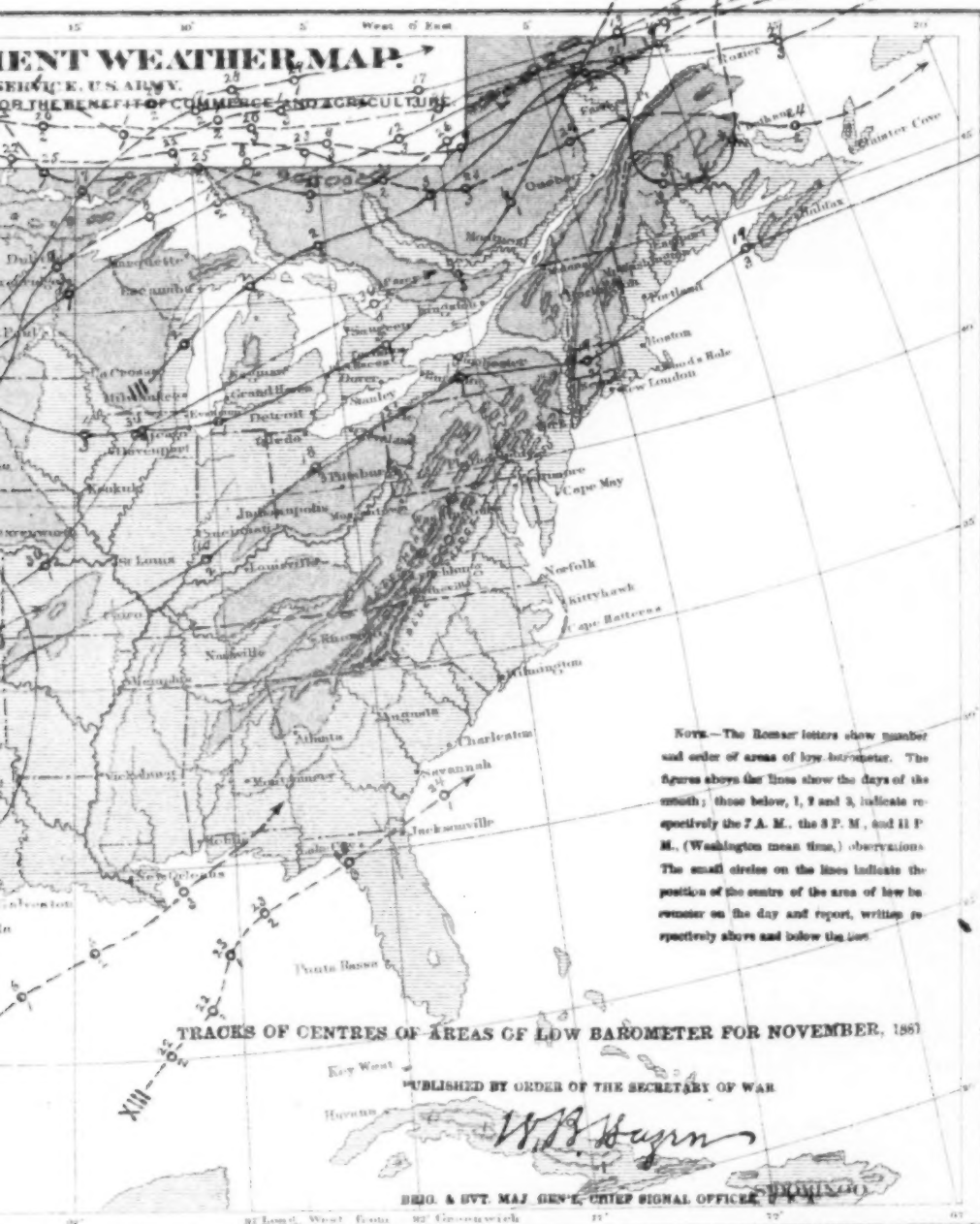
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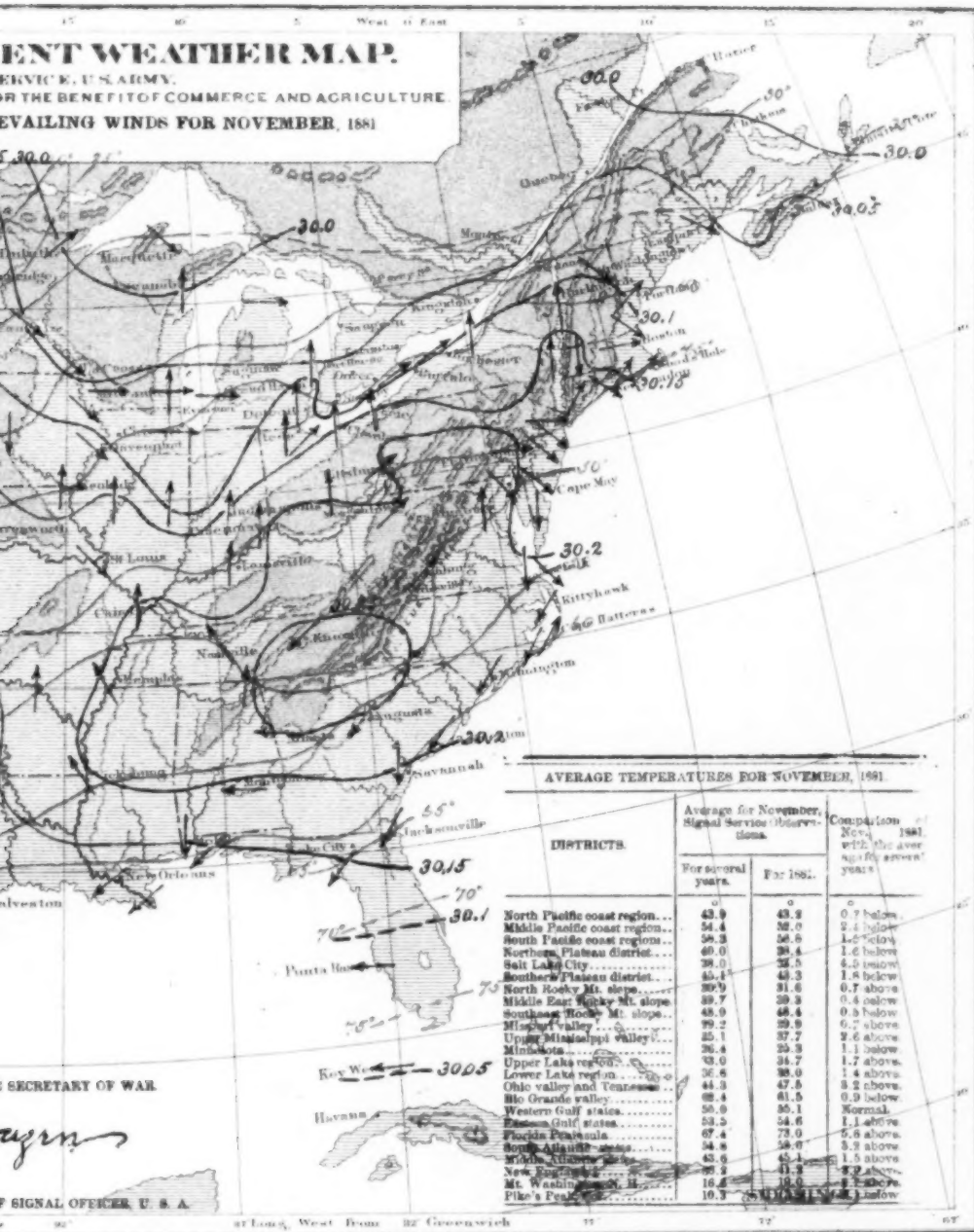




No. 1.







WAR DEPARTMENT SIGNAL SERVICE, U.S. DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF THE ARMY

PRECIPITATION CHART FOR NOVEMBER

AVERAGE PRECIPITATION FOR NOVEMBER

DISTRICTS.	Averages for November.		Comparison of November, 1918, with the average for many years.
	For many years.	For 1918.	
New England.....	Inches. 4.39	Inches 4.00	0.37 deficiency.
Middle Atlantic coast.....	4.06	4.00	0.06 deficiency.
South Atlantic coast.....	3.80	4.30	0.50 excess.
Florida Peninsula.....	3.79	3.79	0.04 deficiency.
Eastern Gulf states.....	4.80	5.50	0.70 excess.
Western Gulf states.....	4.80	5.20	0.40 excess.
Tennessee.....	4.39	5.09	0.69 excess.
Ohio valley.....	3.44	4.40	0.96 excess.
Lower Missouri valley.....	3.66	3.66	0.00 excess.
Upper Lake region.....	3.47	3.50	0.03 excess.
Upper Mississippi valley.....	3.00	3.37	0.37 excess.
Minnesota.....	1.00	1.40	0.40 excess.
Lower Missouri valley.....	3.44	3.00	0.44 excess.
Upper Missouri valley.....	0.85	0.50	0.35 deficiency.
North Pacific Coast region.....	7.40	5.94	1.46 deficiency.
Middle Pacific Coast region.....	3.94	1.00	2.94 deficiency.
South Pacific Coast region.....	0.78	0.33	0.45 deficiency.

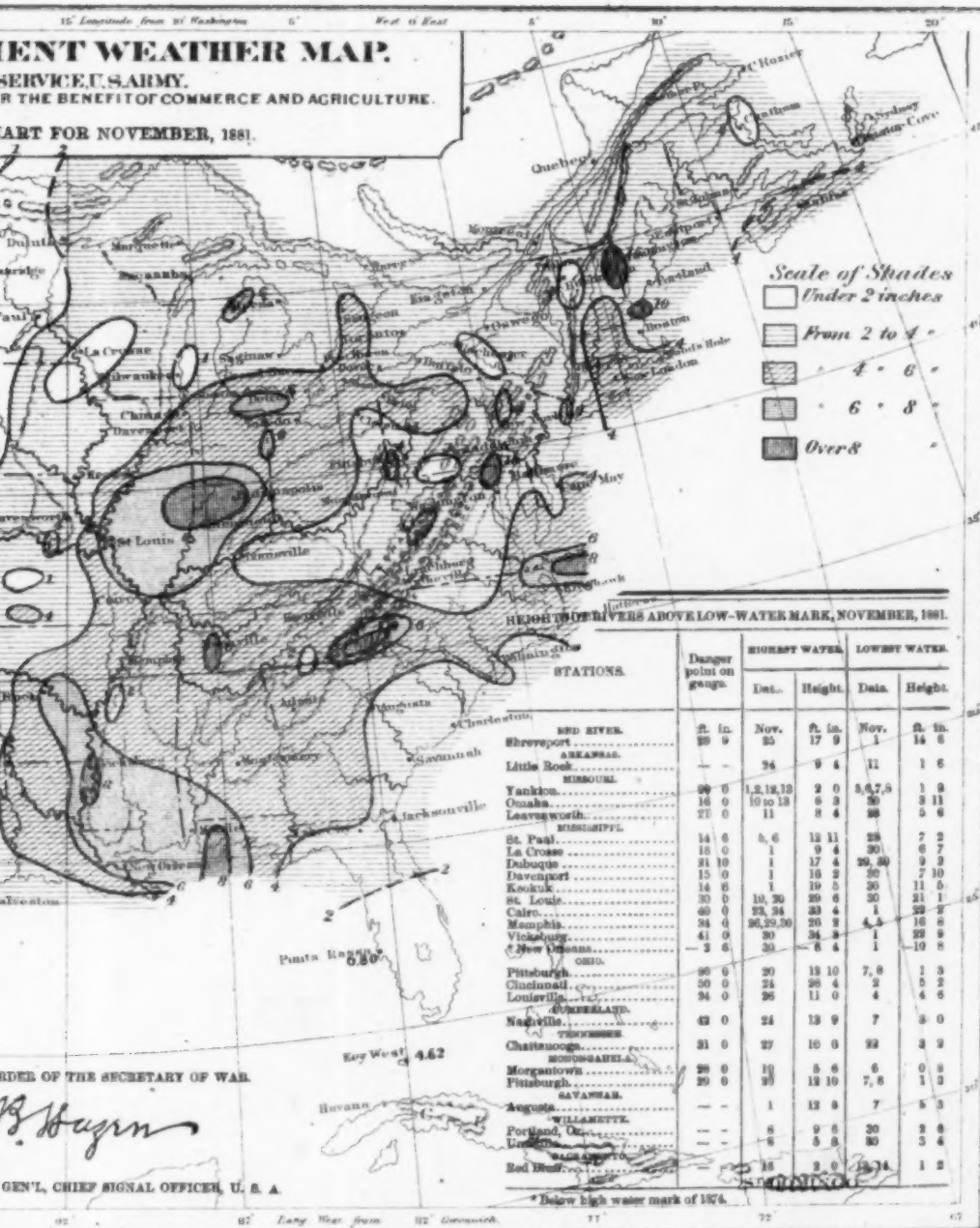
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W.B. Hayes

BRIEF & DVT. MAJ. GEN'L. CHIEF STAFF

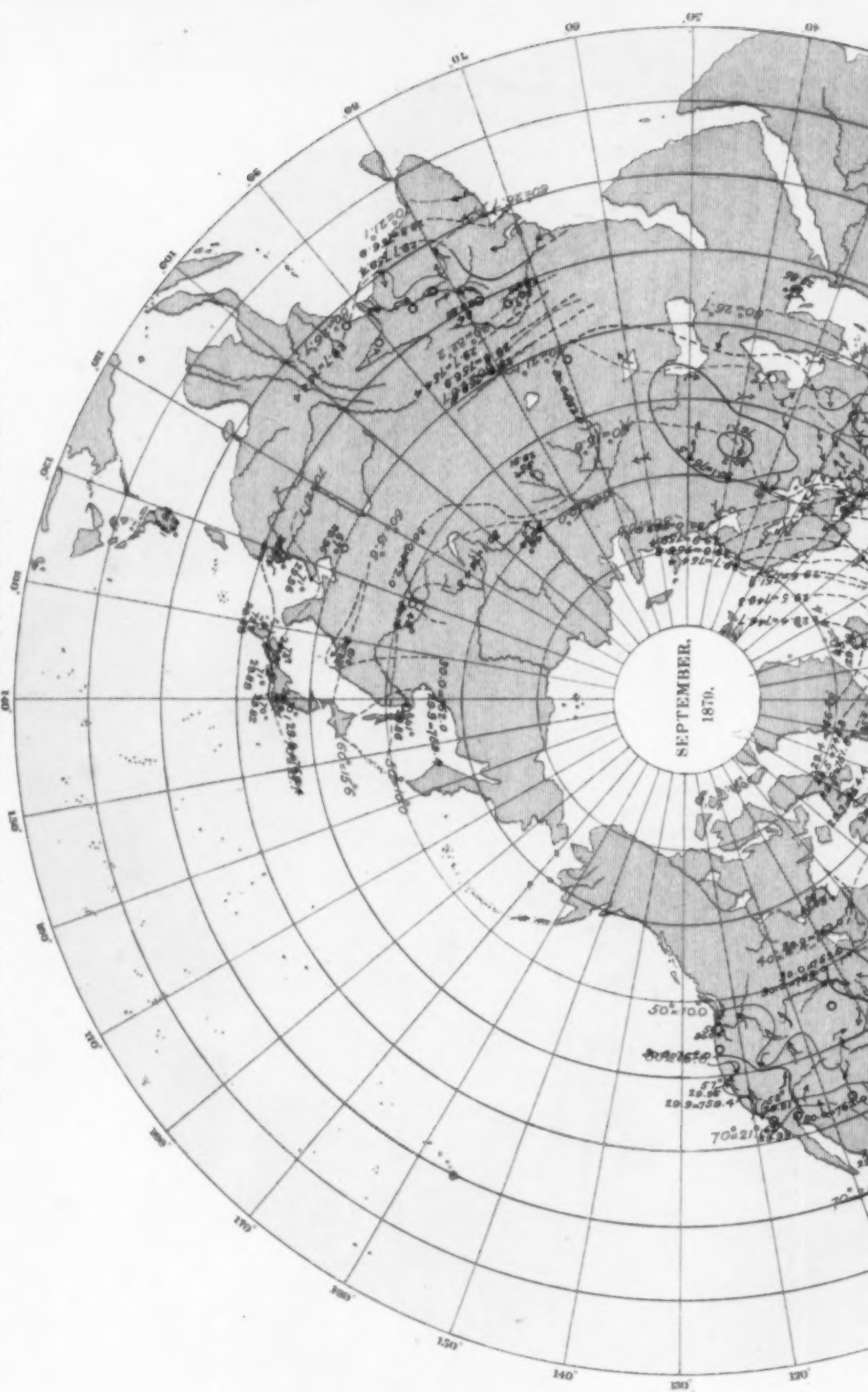
AVERAGE PRECIPITATION FOR NOVEMBER			
DISTRICTS.	Average for November.		Comparison of November, 1906 with the average for many years.
	For many years.	1906.	
	Inches.	inches.	Inches.
New England.....	4.59	4.08	0.57 deficiency.
Middle Atlantic coast.....	4.06	3.79	0.27 deficiency.
South Atlantic coast.....	3.90	3.25	0.65 deficiency.
Florida Peninsula.....	3.79	3.79	0.04 deficiency.
Eastern Gulf states.....	4.03	3.50	0.53 excess.
Western Gulf states.....	4.80	3.95	0.85 excess.
Mountain States.....	3.95	3.95	0.00 excess.
Ohio valley.....	3.44	4.49	1.05 excess.
Lower Lake region.....	3.69	3.69	0.00 excess.
Upper Lake region.....	3.67	3.81	1.14 excess.
North Pacific valley.....	3.00	3.67	0.67 excess.
Minnesota.....	1.00	1.00	0.40 excess.
Lower Missouri valley.....	2.64	3.00	0.36 excess.
Upper Missouri valley.....	0.45	0.92	0.47 excess.
North Pacific Coast region.....	7.49	3.93	3.56 deficiency.
Albion Pacific Coast region.....	3.04	1.93	1.11 deficiency.
South Pacific Coast region.....	0.78	0.20	0.58 deficiency.

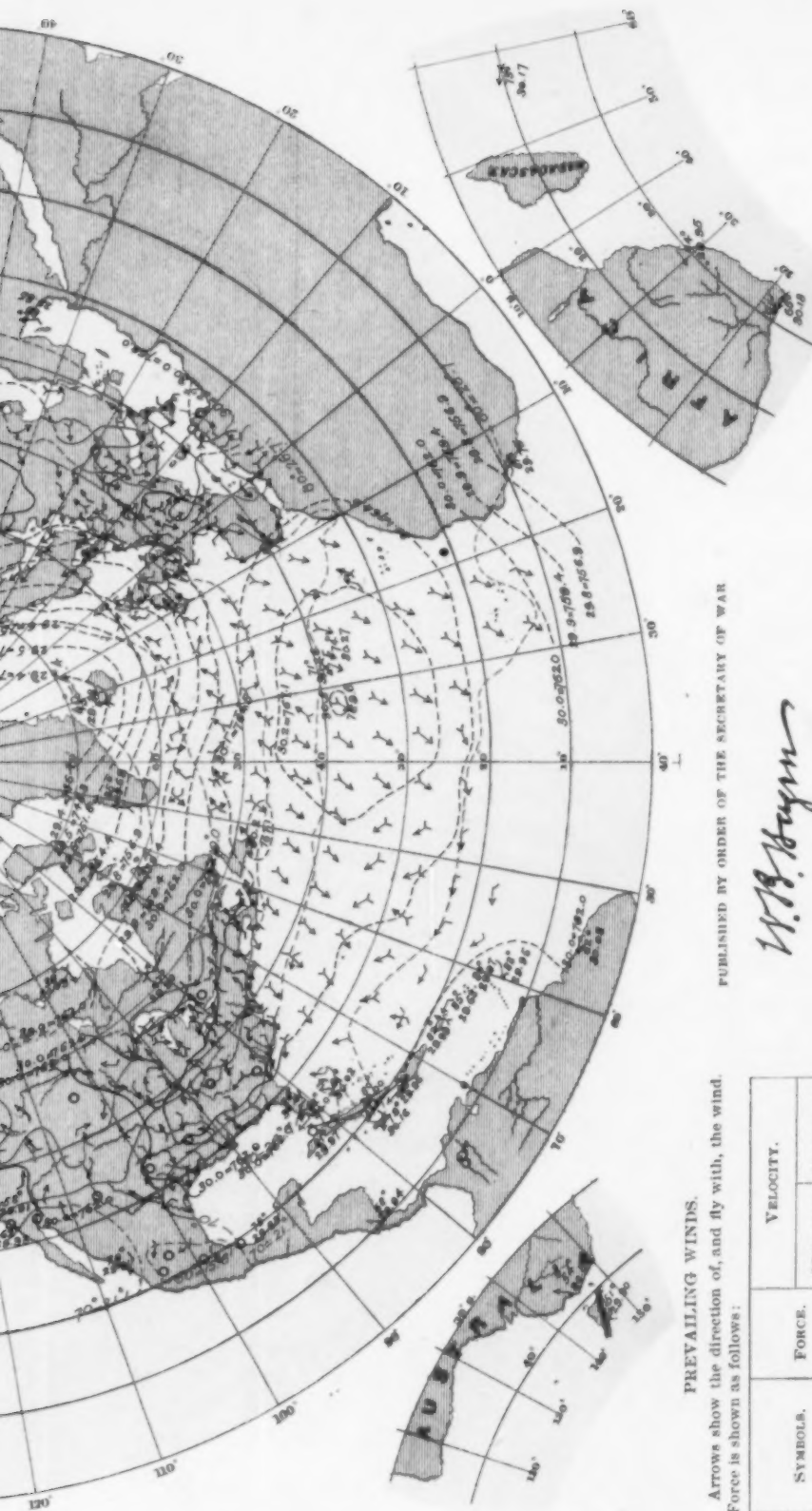
No. III.



No. IV.

Charted from Actual Observations taken Simultaneously, Series commencing January, 1877.
UNITED STATES ARMY.





PREVAILING WINDS.

Arrows show the direction of, and fly with, the wind.
Force is shown as follows:

SYMBOLS.	FORCE.	VELOCITY.	
		Miles per hour.	Metres per second.
○	0	0	0
↑	1, 2	0 to 9	0 to 4.0
↑	3, 4	9.1 to 22.5	4.1 to 10.1
↑	5, 6	22.6 to 40.5	10.1 to 18.1
↑	7, 8	40.6 to 67.5	18.1 to 30.2
↑	9, 10	67.6 up.	30.2 & over.

W. H. H. H.
Brig. & Bet. Maj. Gen'l,
Chief Signal Officer, U. S. A.

ISOBARS AND ISOTHERMS.

Isobars in blue; detached barometer means in English inches.
Isotherms in red; detached temperature means in degrees Fahrenheit.
Broken lines, are doubtful.

INTERNATIONAL MONTHLY CHART.

Showing mean pressure, mean temperature, mean force and prevailing direction of winds at 7:35 A. M., Washington mean time, for the month of September, 1879, based on the daily charts of the International Bulletin

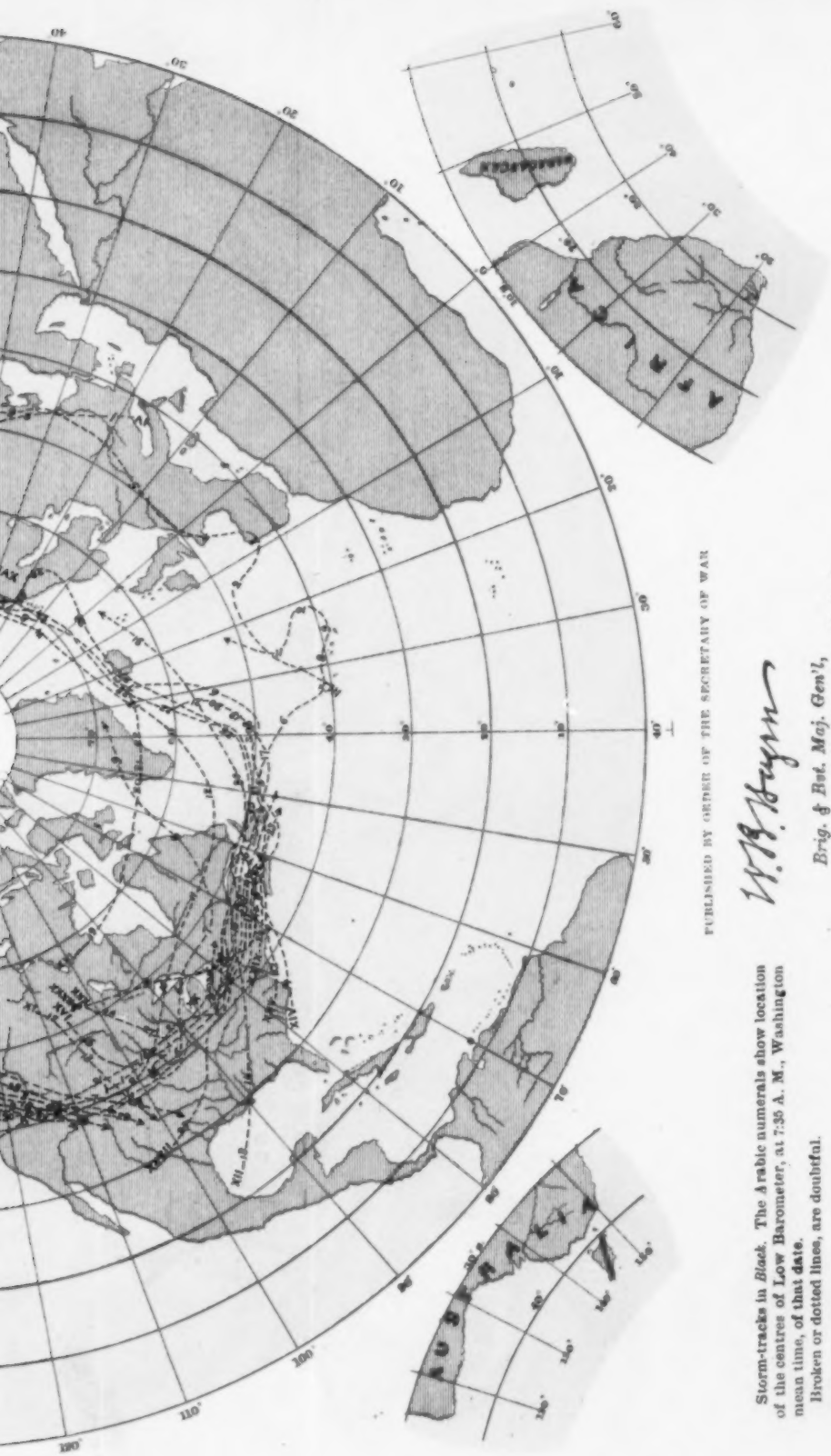
Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No. V.





Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.
Broken or dotted lines, are doubtful.

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W. H. H. H. H.

Brig. & Ret. Maj. Gen'l,
Chief Signal Officer, U. S. A.

INTERNATIONAL CHART.
Showing Tracks of Centres of Low Barometer for
December, 1879.